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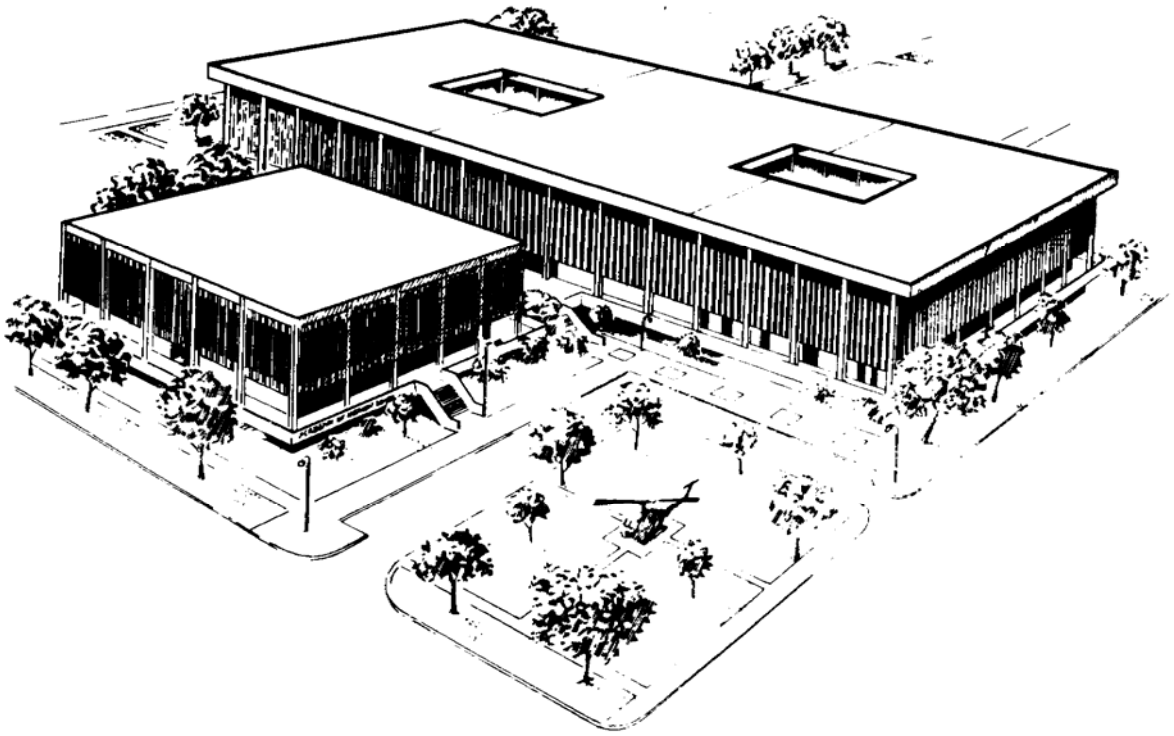
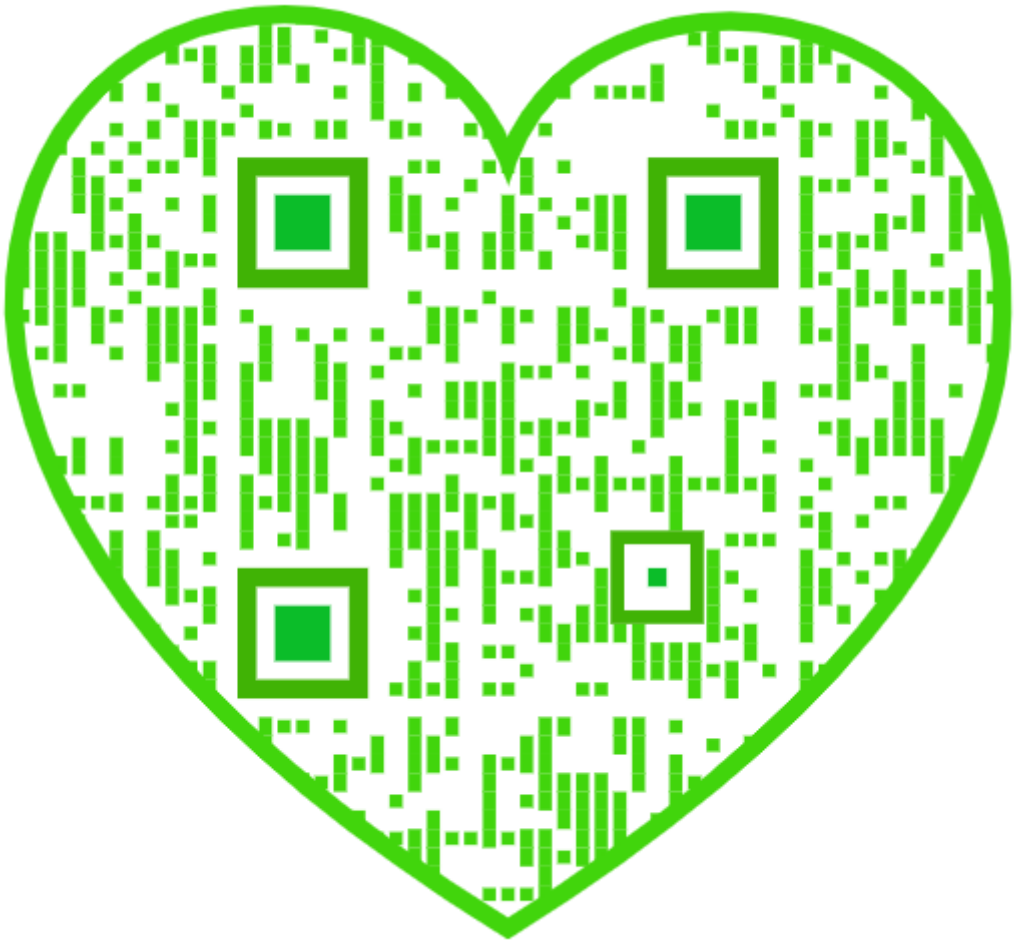


INTEGUMENTARY SYSTEM

SUBCOURSE MD0575 EDITION 100



DEVELOPMENT

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CLARIFICATION OF TRAINING LITERATURE TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.
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CORRESPONDENCE COURSE OF
THE ACADEMY OF HEALTH SCIENCES, UNITED STATES ARMY

SUBCOURSE MD0575

INTEGUMENTARY SYSTEM

INTRODUCTION

The skin is not just a simple thin covering which keeps the body together. The skin is a complex combination of tissues that perform functions necessary for human survival. Our skin helps maintain body temperature, receives stimuli from the environment, and stores chemical compounds. Consider the human predicament if the skin were not waterproof. Every time it rained, each human would absorb water like a sponge. The skin also acts as a protective covering keeping underlying tissues from bacterial invasion and harmful light rays and from drying out. As a Medical NCO, it is important for you to understand the complex functions of the skin.

Subcourse Components:

The subcourse instructional material consists of the following:

Lesson 1, Anatomy and Physiology of the Integumentary System.
Lesson 2, Physical Assessment of the Integumentary System.
Lesson 3, Primary And Secondary Skin Lesions.
Lesson 4, Common Skin Diseases.
Lesson 5, Dermatological Drugs.

Here are some suggestions that may be helpful to you in completing this subcourse:

--Read and study each lesson carefully.
--Complete the subcourse lesson by lesson. After completing each lesson, work the exercises at the end of the lesson, marking your answers in this booklet.

--After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercises. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Branch at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 8 credit hours.

You can enroll by going to the web site http://atrrs.army.mil and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: http://www.usapa.army.mil/pdffiles/p350-59.pdf.

LESSON ASSIGNMENT

LESSON 1	Anatomy and Physiology of the Integumentary System.
LESSON ASSIGNMENT	Paragraphs 1-1 through 1-5.
LESSON OBJECTIVES	After completing this lesson, you should be able to:
	1-1. Identify the three layers of the skin.
	1-2. Identify the locations, structure, and functions of the appendages of the skin.
	1-3. Identify the four major functions of the skin.
	1-4. Identify the major types, characteristics, and functions of tissues of the body.
SUGGESTION	After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 1

ANATOMY AND PHYSIOLOGY OF THE INTEGUMENTARY SYSTEM

1-1. INTRODUCTION

a. The integumentary system, consisting of the skin and its derivatives, is the largest and one of the most complex systems of the body. The surface area of the skin covers about 1.8 square meters (19.4 square feet) of the body of the average male adult. The skin weighs about six pounds and receives roughly one-third of all blood circulating through the body. It is difficult to think of the skin as a system, but it is a complex of organs (sweat glands, oil glands, and so forth). It is elastic, regenerates, and functions in protection, thermoregulation, and sensation.

b. The protection, sensations, secretions, and the other functions which the integument gives to the rest of the body are essential for life. Changes in the normal appearance of the skin often indicate abnormalities or disease of body function. As a medical non-commissioned officer (NCO), you need to recognize changes in skin appearance that your treatment might affect. A basic knowledge of the normal anatomy and physiology of the integumentary system is essential to your job.

1-2. LAYERS OF SKIN

a. **General Information.** Skin consists of three distinct layers: the epidermis, the dermis, and the subcutaneous layer (figure 1-1). The top layer, the epidermis, is attached to the second layer, the dermis. The dermis is thick, connective tissue. Individuals with thick skin have a relatively thick epidermis. Persons with thin skin have a thin epidermis. The subcutaneous layer, the third layer of skin, is located beneath the dermis and consists of areolar (minute spaces in tissue) and adipose (fat) tissues. The first skin layer is fixed to the second skin layer as though the two were glued together. The second and third skin layers are attached in a different way. Fibers from the second layer (the dermis) extend down into the third layer (subcutaneous), anchoring the two layers together. The third layer is firmly attached to underlying tissues and organs of the body.

b. **Epidermis.**

(1) The epidermis is composed of stratified, squamous (scale-like), epithelial cells which are organized in four or five layers. The number of cell layers depends on the location of the skin on the body. The epidermis has five layers on the palms of the hands and the soles of the feet because those areas have more wear and tear. Skin on other parts of the body has four layers of epidermis because there is less exposure to frictions.

(2) These are the layers of the epidermis (figure 1-2) from the deepest to the most superficial.

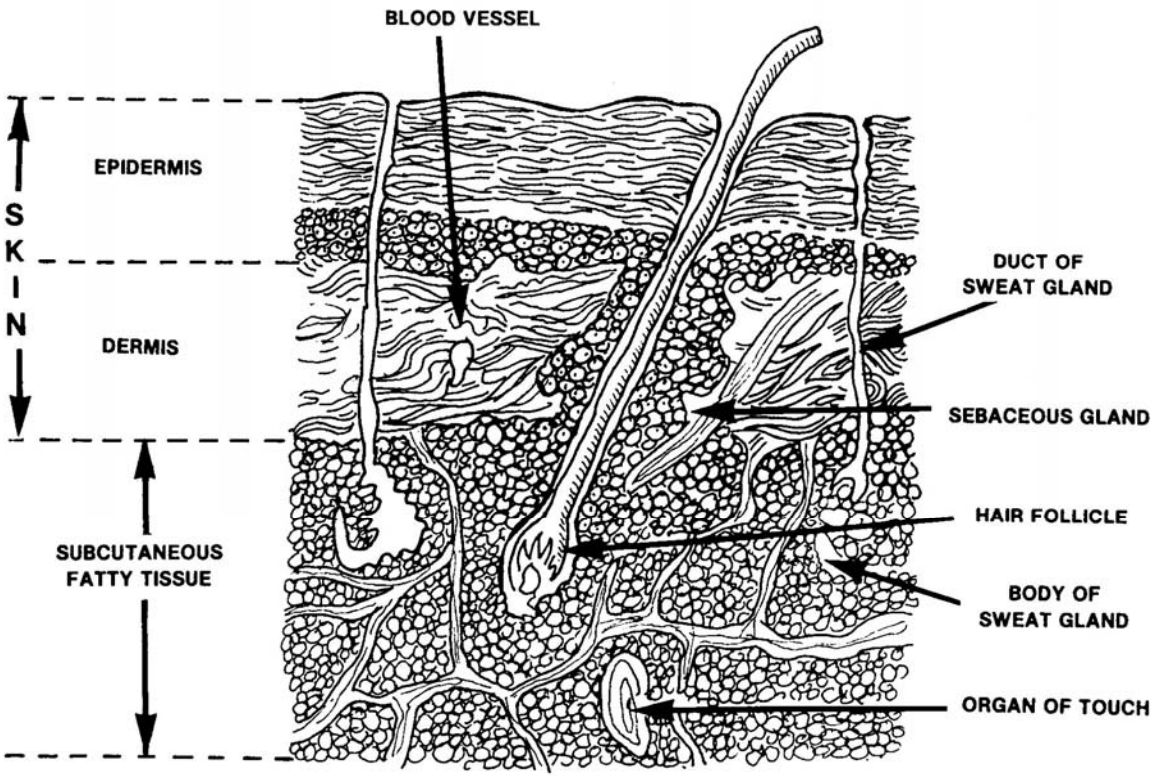

Figure 1-1. Structure of the skin and underlying subcutaneous layer.

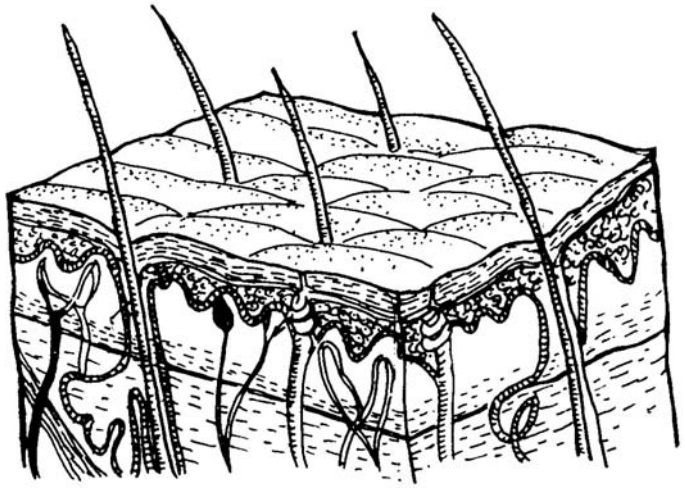

Figure 1-2. Layers of the epidermis.

(a) Stratum basal. Cells continually multiply and push upward toward the surface.

(b) Stratum spinosum. Eight to ten rows of polyhedral (many sided) cells which fit closely together make up this layer of epidermis. New cells germinate in this layer.

(c) Stratum granulosum. Three to five rows of flattened cells containing keratohyalin, a substance that will finally become keratin, make up this layer of epidermis. The nuclei of cells are in various stages of degeneration--breaking down and dying.

(d) Stratum lucidum. This layer is thicker on the palms and soles. The layer consists of several rows of clear, flat, dead cells that contain droplets of a clear substance called eleidin. Eleidin eventually becomes keratin.

(e) Stratum corneum. Twenty-five to thirty rows of flat, dead cells that are completely filled with keratin make up this layer. These cells are shed and replaced continuously so that roughly every twenty-eight days, this layer is new. It is this layer with its water-proofing protein keratin which keeps the body from soaking up water like a sponge. These keratin-filled, dead cells serve as a barrier against light and heat waves, bacteria, and many chemicals.

c. **Dermis.**

(1) Composition. The second layer of skin, the dermis or corium, is sometimes called the true skin. It holds the epidermis in place by connective tissue and elastic fiber. The dermis is very thick on the palms of the hands and the soles of the feet but very thin on the eyelids, penis, and scrotum. The dermis contains the following: numerous blood vessels, nerves, lymph vessels, hair follicles, sweat glands, and sensory receptors.

(2) Dermis layers.

(a) Papillary layer. This upper one-fifth of the dermis has small, finger-like projections called dermal papillae. These projections reach into the concavities between ridges in the deep surface of the epidermis. This region or layer consists of loose connective tissue containing fine elastic fibers.

(b) Reticular layer. This layer makes up the rest of the dermis. The reticular layer consists of dense, irregularly arranged connective tissue which has interlacing bundles of collagenous and coarse fibers. Between the fibers are adipose (fat) tissue, hair follicles, nerves, oil glands, and the ducts of sweat glands. The collagenous and elastic fibers together give the skin strength, extensibility, and elasticity.

NOTE: Extensibility is the ability to stretch. Elasticity is the ability to return to original shape after extension or contraction.)

The skin stretches during pregnancy, obesity, or edema. Elasticity allows the skin to contract after such stretching. If the skin has been stretched severely, small tears may occur. Initially, the tears are red; they lose the redness but remain visible as silvery white streaks called striae.

d. **Subcutaneous-Adipose.** This layer is composed of loose connective tissue combined with adipose (fatty) tissue. The subcutaneous layer of skin has several important functions:

(1) Storehouse for water and particularly for fat. Much of the fat in an overweight person is in this layer.

(2) Layer of insulation protecting the body from heat loss.

(3) Pads the body giving the body form and shape and cushioning and protecting the body from blows.

(4) Provides a pathway for nerves and blood vessels.

1-3. APPENDAGES ASSOCIATED WITH THE SKIN

a. **Hair.** See figure 1-3.

(1) General information. Hairs, growths of the epidermis, are distributed over various parts of the body. The primary function of hair is to protect. Hair on the head protects the scalp from injury and sunburn. Eyelashes and eyebrows protect eyes from foreign matter. Hair in the nostrils and external ear canal protects from insects and dust. Hair is a keratinized structure that grows out of a tubular canal called a hair follicle.

(2) Distribution. Nearly all parts of the body have hair. An average adult probably has about five million hairs, about 100,000 of these on the scalp. Straight hairs are oval or cylindrical in cross section while a cross section of curly hair shows it flattened. Straight hairs are stronger than curly hairs.

(3) Structure. A shaft and a root make up each hair.

(a) Shaft. The hair shaft is the superficial part of the hair that sticks out above the skin surface. A course hair shaft has three parts: the inner medulla, the middle cortex, and the outermost layer, which is the hair cuticle. Polyhedral cells with granules of eleidin and air spaces make up the medulla. (The medulla may or may not be present in fine hair.) The cortex is the major part of the hair shaft and has cells that contain pigment in dark hair. These cells are mostly air in white hair. The cuticle, the outermost layer of the shaft, is composed of one layer of thin, flat, scale-like cells that are heavily keratinized.

(b) Root. The hair root is the portion below the skin surface. The root is embedded in the epidermis and penetrates the dermis and the subcutaneous layers of skin. The root also contains a medulla, cortex, and cuticle. The hair follicle, surrounding the root, is made up of an external root sheath and an internal root sheath (both composed of epithelium).

(c) Bulb. An enlarged, onion-shaped structure called a bulb is at the base of each hair follicle. The bulb contains the papilla of the hair, an indentation filled with loose connective tissue. The papilla of the hair contains many blood vessels and provides nourishment for the growing hair. There is a region in the bulb called the matrix. When older hairs are shed, matrix cells produce new hairs by cell division. The replacement occurs within the same follicle that lost a hair.

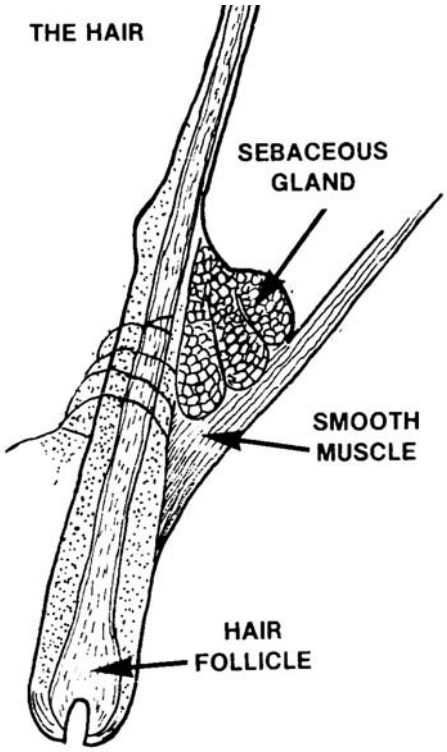

Figure 1-3. Principal parts of a hair.

(d) Arrector pili. The arrector pili are bundles of smooth muscle that extends from the dermis of the skin to the side of the hair follicle. Normally, hair is at an angle to the surface of the skin. Under stress, from fright or cold, for example, the arrector pilorum muscles contract and pull the hairs into a vertical position. The result is "goosebumps" or "gooseflesh" because the muscle contraction has made the skin around the hair shaft rise a little.

(4) Color. A substance called melanin is responsible for hair color. Melanocytes in the matrix of the bulb of the hair follicle form melanin. Hair pigment exists in three colors: yellow, brown, and black. Yellow comes from pheomelanin, brown pigment from brown melanin, and black pigment from black melanin. Combinations of different amounts of the three pigments make for variations in hair color. Graying hair is the result of the loss of hair pigment. The cause is thought to be a progressive inability of the melanocytes to make tyrosinase, the enzyme necessary for the synthesis of melanin. Air in the medullary shaft causes white hair.

(5) Hair growth and replacement. There is a cyclic pattern-- alternating growing and resting periods--to hair growth and replacement. The matrix cells are active during the growing phase when these cells divide thus increasing their number, push upward, and eventually die. A hair, dead protein tissue, is the product. Hair grows about 1 mm (0.04 inch) every three days. During the resting phase, the matrix is inactive, and these cells shrink causing the hair root to detach itself from the matrix and the hair to move up the hair follicle slowly. The hair may stay in this position for a while until it is pulled out, shed, or pushed up by a replacing hair. The cycle of hair growth is different in different parts of the body. Scalp hair grows steadily and continuously for two to six years. Growth stops, and after three months, the hair is shed. Three months later a new hair starts to grow from the same follicle. On the other hand, eyebrows have a growing phase of only about ten weeks, which is why eyebrow hair is not very long.

b. **Nails.**

(1) Parts of the nail. Nails are hardened, horny-like epidermal cells. These cells form a clear, solid covering over the back surfaces of the fingers and toes. Each nail has three parts: nail body, free edge, and nail root. The part of the nail you can see is the nail body. The free edge is the part of the nail that extends beyond the finger or toe, and the nail root is the part of the nail that is hidden in the nail groove. Tissues under the nails have many blood vessels, which accounts for the fact that the nail body appears to be pink. The whitish, moon-shaped area near the nail root is the lunula. It is whitish in color due to tissues with blood vessels that do not show through. The nail fold is the fold of skin around the borders of the nail. The skin beneath the nail is the nail bed.

(2) Growth of the nail. Nail growth takes place in the part of the nail under the body and nail root. Superficial cells in the matrix change into nail cells, and the outer, harder nail layer is pushed forward making the nail longer. Fingernails grow at a rate of approximately 1 mm (0.04) per week while toenails grow a little more slowly. It takes approximately three and a half to five and a half months for a lost fingernail to regrow. A lost toenail takes a little longer--six to eight months.

c. **Skin Glands.** These are the three kinds of skin glands: sebaceous glands; sweat glands (sudoriferous glands); and modified sweat glands. See figure 1-4.

(1) Sebaceous glands. These glands, not found in the palms of the hands or the soles of the feet, are oil glands that are connected to hair follicles. The glands are in many parts of the body and exist in a variety of shapes and sizes. Sebaceous glands secrete a substance called sebum, an oily substance that is a mixture of fats, cholesterol, proteins, and inorganic salts. Sebum acts as a skin lubricant keeping hair from drying and becoming too brittle. This substance also forms a protective film that prevents too much water from evaporating from the skin; this protective film is

responsible for the skin being soft and pliable. More sebum is produced in puberty, while less sebum is produced in old age. Sebum has antifungal and antibacterial properties. If too much sebum accumulates in the sebaceous glands of the face, causing these glands to get bigger, blackheads can develop. The air oxidizes the sebaceous gland fatty material discoloring that fatty substance, hence blackheads. If fatty substances accumulate in the sebaceous glands, pus-producing bacteria in those substances can cause pimples to form. The skin problem acne is an inflammation of sebaceous glands. A few blackheads or whiteheads on the face may be a sign of approaching puberty.

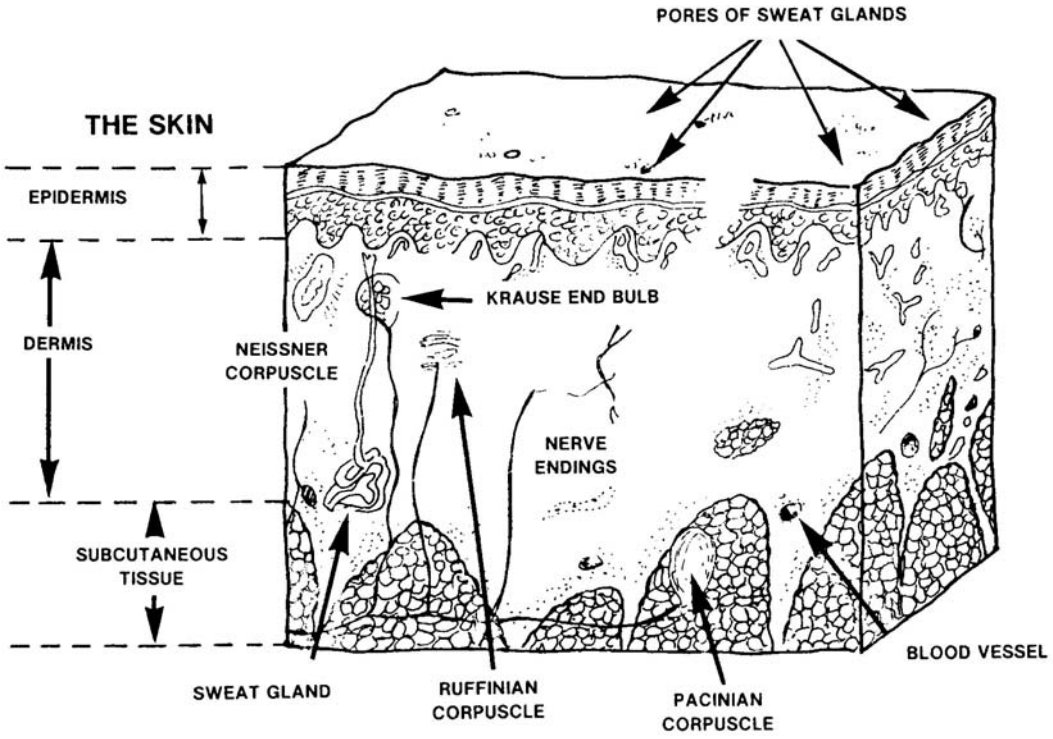

Figure 1-4. Skin glands.

(2) Sweat glands (sudoriferous glands).

(a) Characteristics. There are two principal types of sweat glands: apocrine sweat glands and eccrine sweat glands. Both are simple, tubular glands distributed throughout the skin. One difference is that apocrine sweat glands are branched and eccrine sweat glands are coiled. Another difference is that apocrine glands are located in the axilla, pubic region, and pigmented areas of the breasts. The eccrine glands are located throughout the body except in the margins of the lips, nail beds of fingers and toes, and the eardrums. Eccrine sweat glands are most numerous in the skin on the palms of the hands and the soles of the feet. Sweat gland density in the palms of the hands can be as high as 3,000 glands per square inch.

(b) Secretion. The part of the apocrine gland that secretes sweat is located in the dermis; for eccrine glands, that portion of the gland is in the subcutaneous layer of skin. The substance secreted by both types of sweat gland is perspiration or sweat. Pure sweat contains much the same elements as blood, but in lower concentrations. The chief element is water, then sodium chloride, potassium, glucose, ureas, and lactate. Pure sweat is odorless. Odor comes from sweat interacting with bacteria on the skin.

(c) Function. The principal function of the sweat glands is to help regulate body temperature. Sweating can cool the body because body heat is necessary for the water in sweat to evaporate. The amount of water lost by sweating can be as much as eight pounds of body weight per day. The function of apocrine glands is to respond to emotional stimulation.

(3) Modified sweat glands.

(a) Ceruminous (wax) glands. In some parts of the skin, sudoriferous glands are modified and become ceruminous glands. These are simple, coiled, tubular glands located in the external meatus of the ear canal. The substance secreted is wax, also called cerumen. This substance may accumulate resulting in too much earwax. The combination of hair and earwax helps prevent foreign objects from entering the ear.

(b) Ciliary glands. These glands are located on the edges of the eyelids. The glands secrete a milky, alkaline sweat. The function of the sweat is to moisten the inner eyelids.

1-4. FUNCTIONS OF THE SKIN

a. **Sensation.**

(1) Sensation refers to a state of awareness of conditions of the body. Four prerequisite conditions must be present in order for a sensation to occur:

(a) Stimulus (or change in environment)--something capable of initiating a response by the nervous system.

(b) Receptor or sense organ--something must be able to pick up the stimulus and convert the stimulus to a nerve impulse. A sense receptor or sense organ is specialized tissue that is very sensitive to conditions affecting the body.

(c) Conductor--the impulse must be conducted along a nerve pathway from the receptor or sense organ to the brain.

(d) Translator--a region of the brain must translate the impulse into a sensation.

(2) Receptors can be classified according to their location. Exteroceptors are near the surface of the body. Viscereceptors or enteroceptors are located in the blood vessels and viscera. Proprioceptors are receptors located in muscles, tendons, joints, and the external ear. Exteroceptors, located near the surface of the body, provide information about the external environment. These receptors, sensitive to stimuli outside the body, transmit sensations of hearing, sight, smell, taste, touch, pressure, temperature, and pain. The exteroceptors located in the skin provide the sensations of pain, touch, temperature, and pressure.

(a) Pain. Receptors for pain are not only found in the skin but in practically every tissue of the body. These receptors may be stimulated by stimuli for other sensations. When the receptors for touch, pressure, heat, and cold reach a certain threshold, they stimulate the sensation of pain also. Since pain receptors are sensitive to all stimuli, these receptors perform a protective function by telling the body of changes that may be a danger to the body. There are two types of pain receptors: somatic pain receptors and visceral pain receptors. Somatic pain comes from the stimulus of receptors in the skin and receptors in skeletal muscles, joints, tendons, and fascia. Visceral pain comes from stimulation of receptors in the viscera.

(b) Touch. Touch sensations generally result from stimulation of tactile receptors in the skin or the tissues immediately beneath the skin. Light touch refers to the ability to recognize exactly what point of the body is touched. Crude touch refers to the ability to perceive that something has touched the skin although its exact location, shape, size, or texture cannot be determined. Receptors for touch include root hair plexuses, free nerve endings, Merkel's discs, Meissner's corpuscles, and end organs of Ruffini. Root hair plexuses are dendrites arranged in networks around the roots of hairs. Free nerve endings are found everywhere in the skin. Merkel's discs are disc-like formations of dendrites attached to deeper layers of epidermal cells. Meissner's corpuscles, located in the dermal papillae of the skin, are egg-shaped receptors containing a mass of dendrites enclosed by connective tissue.

(c) Temperature. These receptors are sensitive to heat and cold. It is thought that temperature receptors are free nerve endings.

(d) Pressure. Pressure receptors generally come from the stimulation of touch receptors in deeper tissues. Sensation from these receptors lasts longer and is spread over a greater area than the sensation from touch receptors.

b. **Protection.** The function of skin is to protect the body's underlying structures from bacterial invasion, drying out, and harmful light rays. The acid mantle (pH 4.2 to 5.6) on the skin surface protects the body from bacteria and irritants. Skin keeps the body from excessive water and electrolyte loss.

c. **Thermoregulation.** Man is capable of maintaining a relatively constant body temperature (37°C or 98.6°F). If man is in an environment of 100°F, sensing devices in the skin called receptors pick up the heat stimulus and send a message to the brain. A temperature-regulating area of the brain sends nerve impulses to the sudoriferous glands that cause these glands to produce more perspiration. As the perspiration evaporates from the skin surface, the skin surface is cooled, and the body temperature is maintained.

d. **Types of Tissues**. See figure 1-5.

(1) General. Tissue can be defined as a group of similar cells and their intercellular substance functioning together to perform a specialized activity. Some tissues move body parts. Other tissues move food through body organs while some tissues protect and support the body. Other tissues produce chemicals such as enzymes and hormones. Body tissues are classified by function and structure into four principal types: epithelial tissue, connective tissue, muscular tissue, and nervous tissue. Two of these types will be examined in this subcourse: epithelial tissue, which covers body surfaces or tissues, lines body cavities, and forms glands; and connective tissue, which protects and supports the body and its organs and binds organs together.

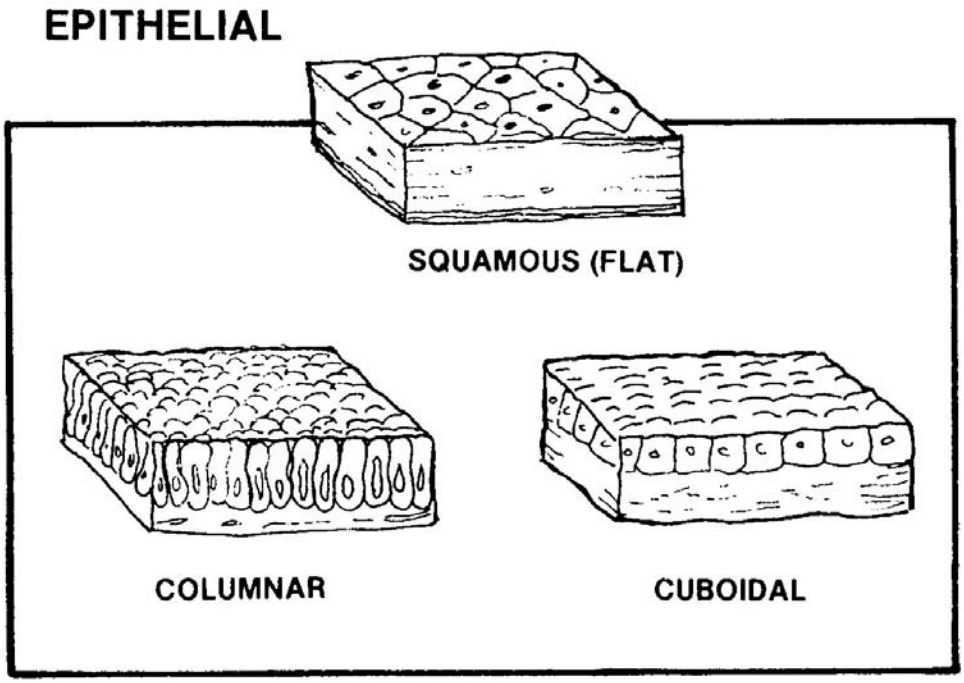

Figure 1-5. Types of skin tissues.

(2) Epithelial tissues. The tissues on the outer surfaces of the body are faced with epithelial cells. The deep surfaces of the skin are layered with connective tissue which strengthens membranes. There are two types of epithelium tissue: mucous membrane epithelial tissues (covering and lining epithelium) and serous membrane epithelial tissues (glandular epithelium). Both types of epithelial tissue consist of tightly packed cells with very little intercellular material between the cells. The cells are arranged in continuous sheets with either one layer or several layers. It is possible for nerves to extend through the sheets but blood vessels do not. The underlying connective tissue holds the epithelial tissue in place and prevents it from being torn. A thin extra cellular cellar called the basement membrane glues the epithelium and the connective tissue together. All epithelial cells face a certain amount of wear, tear, and injury. To replace themselves, epithelial cells divide and produce new cells.

(a) Mucous membrane epithelial tissues. These epithelial cells line the tubes and cavities that open to the exterior of the body; for example, the mouth, nose, intestinal tract and urinary and reproductive tracts are lined with mucous membrane epithelial cells. Simple epithelial cells (tissue cells arranged in a single layer) line the air sacs of the lungs where oxygen is exchanged with carbon dioxide. This type of lining is present in the part of the kidney that filters the blood. The inner surfaces of interior parts of the ear are lined with epithelial cells. This lining, as evidenced by these examples, is found in body parts that have very little wear and tear. Another function of mucous membrane epithelial cells is to secrete mucus that serves as protection against the entry of foreign particles into the body. Some epithelial cells are ciliated. Cells with hair-like processes called cilia are found in some parts of the respiratory tract. These cilia wave in unison and move mucus plus trapped foreign particles toward the throat where the substance can either be swallowed or coughed out. This is the process of filtering air before it enters the lungs.

(b) Serous membrane epithelial tissues. These tissues are better known as glands or glandular epithelium. Serous membrane epithelial cells may be one cell or a group of specialized epithelial cells whose function is to secrete substances into ducts, onto a surface, or into the blood. Glandular cells work to produce substances and expend energy in that effort. Glands that secrete substances into ducts (tubes) that empty at the surface of covering and lining epithelium or directly onto a surface are classified as exocrine glands. Products secreted by exocrine glands include mucus, perspiration, oil, wax, and digestive enzymes. Those glands that have no ducts and secrete their substances directly into the blood are classified as endocrine glands. Endocrine glands secrete hormones. Examples of endocrine glands include the pituitary, thyroid, and adrenal glands. Serous membrane epithelial tissues also cover some organs of the body: the pleura enclose the lungs; the pericardium covers the heart; and the peritoneum lines the abdominal cavity. These membranes secrete a thin fluid that prevents friction when organs are in contact with one another.

(3) Connective tissues. Connective tissue (figure 1-6) primarily binds and supports, is highly vascular, and has a rich blood supply. An exception is cartilage that is avascular (no blood vessels). Cells in connective tissue are widely scattered rather than closely packed, and there is a lot of intercellular material. The general functions of connective tissue are protection, support, and the binding together of various organs. These tissues anchor and support organs and cover bone and cartilage. Two types of connective tissue will be explored in this lesson: skeletal connective tissue and fascial (fibrous) connective tissue.

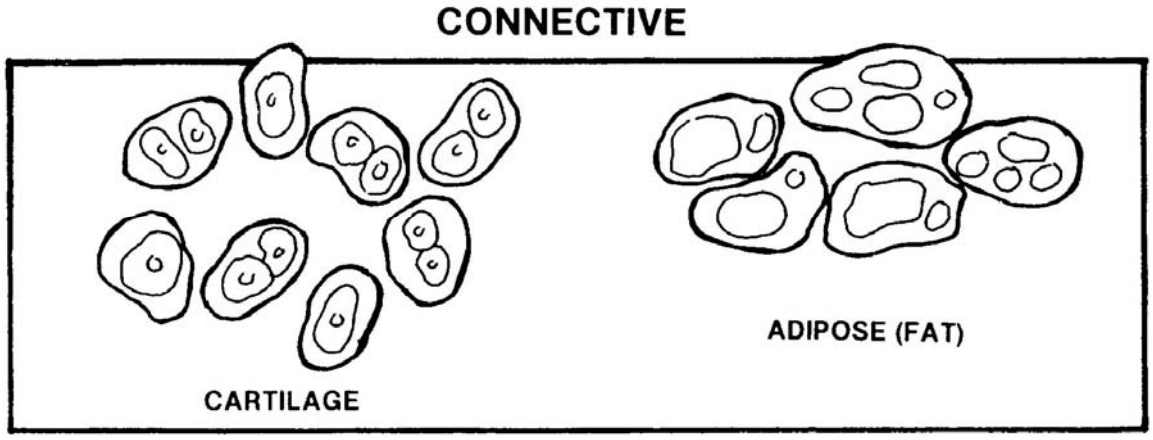

Figure 1-6. Connective tissue.

(a) Skeletal connective tissue. Synovial membranes line the joint cavities. Like serous membranes, these membranes do not open to the exterior. They cover tendons and secrete a thin lubricant fluid. Synovial membranes are composed of loose connective tissue with elastic fibers and varying amounts of fat. Synovial fluid is secreted by synovial membranes. This fluid lubricates the ends of bones as they move at joints and nourishes the articular cartilage covering the bones that form the joints. Periosteum is a connective membrane classified as synovial connective membrane. Periosteum covers bone, and perichondrium covers cartilage.

(b) Fascial (fibrous) connective tissue. The term fascia refers to a sheet or a broad band of fibrous connective tissue that is under the skin or around muscles and other organs of the body. There are three types of fascia: superficial fascia or subcutaneous layer (immediately deep in the skin); deep fascia (the most extensive of the three types); and subserous (visceral) fascia (located between the internal layer of deep fascia and a serous membrane).

1 Superficial fascia (subcutaneous layer). This type of connective tissue covers the entire body and varies in thickness in different regions. It is quite thin on the back of the hand but quite thick on the abdominal wall. The functions of this tissue include serving as a storehouse for water and for fat; forming an insulating layer to protect the body from loss of heat; providing a layer of protection from blows to the body; and providing a pathway for nerves and vessels.

2 Deep fascia. This type of connective tissue lines the body wall and extremities and holds muscles together, separating them into functioning groups. Deep fascia allows free movement of muscles, carries nerves and blood vessels, fills spaces between muscles, and sometimes provides the origin for muscles.

3 Subserous (visceral) fascia. This type of tissue forms the fibrous layer of serous membranes, covering and supporting the viscera, and attaching the parietal layer of serous membranes to the internal surface body wall.

1-5. CLOSING

The protection, sensations, secretions, and the other functions that the integument gives to the rest of the body are essential for life. Indeed, changes in the normal appearance of the integument often indicate abnormalities or diseases of body function. As Medical NCOs, you need to recognize changes in the appearance of the integument that your treatment might affect. A basic knowledge of the normal anatomy and physiology of the integumentary system is essential to your job. The integumentary system 's role is underrated but, as can be seen, it is essential. The tissues of the body are involved in every function of the body--from hormone secretion to protection. Knowledge of the structure of tissues will help you in understanding the other systems of the body.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS. The following exercises are to be completed by writing the answer in the space provided. After you have completed all the exercises, turn to the "Solution to Exercises" at the end of the exercises and check your answers.

1. The three layers of skin are the epidermis, the dermis, and the_____ .

2. Individuals with thin skin have a thin _____ layer of skin.

3. Mucous membranes and serous membranes are two types of_____tissue.

4. What causes the odor associated with sweat? _____

   _____.

5. What causes " goose bumps?" _____

   _____

   _____.

6. _____ glands secrete a lubricant (sebum) that keeps hair from drying out and becoming too brittle.

7. Blackheads are caused by: _____

   _____

   _____.

8. The layer of epidermis that is completely filled with keratin is the _____.

9. _____ is the waterproofing protein in the skin which keeps humans from soaking up water like a sponge.

10. The dermis, the second layer of skin, contains nerves, sweat glands, _____, lymph vessels, and _____.

11. The reticular layer of the dermis contains fibers which give the skin two important qualities: the ability to _____ and the ability to _____ after extension or contraction.

12. List three functions of the subcutaneous layer of skin.
    a. _____.
    b. _____.
    c. _____.

13. The primary function of hair is _____.

14. How many hairs does an average adult have? _____.

15. How many hairs does an average adult have on the scalp? _____.

16. List the three parts of a hair shaft.
    a. _____.
    b. _____.
    c. _____.

17. A person with white hair has mostly _____in the cortex of the hair; a person with black hair has _____ in the hair cortex.

18. _____ is a keratinized structure which grows out of a tubular canal called a hair follicle.

19. Melanocytes in the hair bulb are responsible for _____ of hair.

20. The papilla of the hair, an indentation filled with loose connective tissue, contains many _____and provides _____ for growing hair.

21. Sebaceous glands are _____which are connected to hair follicles.

22. Sebum, a skin lubricant secreted by sebaceous glands, serves two functions:

    _____

    and _____

    _____.

23. What causes acne? _____

24. The whitish, moon-shaped area near the root of a fingernail is the _____.

25. Exteroceptors, receptors located in the skin, stimulate what four basic sensations?

    a. _____.

    b. _____.

    c. _____.

    d. _____.

26. The acid mantle on the skin surface protects the body from _____ and _____.

27. If you are in an environment that is too hot, skin receptors cause sudoriferous glands to produce _____ which cools your body.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 1

1. Subcutaneous. (para 1-2a)

2. Epidermal. (para 1-2a)

3. Epithelial. (para 1-4d(2))

4. Sweat acting with bacteria on skin causes odor. (para 1-3c(2)(b))

5. Arrector pilorum muscles contract pulling the hairs into a vertical position. This muscle contraction has made the skin around the hair shaft raise a little, and we see "goose bumps." (para 1-3a(3)(d))

6. Sebaceous glands. (para 1-3c(1))

7. Too much sebum accumulates in the sebaceous glands. When air reaches this fatty accumulation, oxidation takes place and the fatty substance turns black. (para 1-3c(1))

8. Stratum corneum. (para 1-2b(2)(e))

9. Keratin. (para 1-2b(2)(e))

10. Sensory receptors.
    Hair follicles. (para 1-2c(1))

11. Stretch.
    Return to original shape. (para 1-2c(2)(b))

12. You are correct if you listed any three of the following:

    Storehouse for water and fat.
    Insulation protecting the body from heat loss.
    Pads the body giving it form and shape and protecting the body from blows.
    Pathway for nerves and vessels. (para 1-2d)

13. To protect. (para 1-3a(1))

14. About five million hairs. (para 1-3a(2))

15. About 100,000 hairs. (para 1-3a(2))

16. Medulla.
    Cortex.
    Cuticle. (para 1-3a(3)(a))

17. Air.
    Pigment. (para 1-3a(4))

18. Hair. (para 1-3a(1))

19. Pigmentation. (para 1-3a(4))

20. Blood vessels.
Nourishment. (para 1-3a(3)(c))

21. Oil glands. (para 1-3c(1))

22. Keeps the skin pliable and soft.
Prevents too much water from evaporating from the skin. (para 1-3c(1))

23. Acne is caused by an inflammation of the sebaceous glands. (para 1-3c(1))

24. Lunula. (para 1-3b(1))

25. .Pain.
Touch.
Temperature.
Pressure. (para 1-4a(2)(a))

26. Bacteria.
Irritants. (para 1-4b)

27. Perspiration. (para 1-4c)

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2	Physical Assessment of the Integumentary System.
LESSON ASSIGNMENT	Paragraphs 2-1 through 2-8.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

2-1. Identify the considerations for taking a patient history during a physical assessment of the integumentary system.

2-2. Identify the considerations for inspection of the integumentary system.

2-3. Identify the physical findings and indications of inspection.

2-4. Identify the physical findings that may be indicated by palpation.

2-5. Identify the specialized procedures that may be indicated by inspection and palpation.

2-6. Identify the factors to consider in breast examination.

SUGGESTION After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 2

PHYSICAL ASSESSMENT OF THE INTEGUMENTARY SYSTEM

2-1. INTRODUCTION

Examination of the integumentary system is a vital tool to the Medical NCO in recognition and diagnosis of a wide range of disorders. The physical assessment, when properly performed and acted upon, may play an integral role in the health care of your patients.

2-2. PATIENT HISTORY

a. **General Information.** The patient's history helps the doctor in diagnosing a skin problem. Skin is the barrier between man and his environment. Physical and chemical agents in the environment--poison ivy, insecticides, sunlight, cold, heat, contact allergens, and so forth--act on the skin and cause a variety of skin disorders. To understand what the patient's skin has been exposed to over time, the examiner must obtain the following information:

(1) The patient's occupation.

(2) Medications used on the skin problem.

(3) The patient's experience with drugs.

(4) The season of the year when the skin problem is most evident.

(5) The patient's immediate environment including contact with plants, animals, metal, and so forth.

(6) Physiologic state of the patient; pregnant, menses.

(7) Foods recently eaten.

(8) The patient's hobbies.

(9) The patient's emotional state.

(10) Symptoms at the skin lesions--burning, itching, pain, and so forth.

(11) Patient's allergies.

(12) Previous treatment for this skin problem if it has occurred before.

b. **Importance of Drug Information.** Drugs are often the cause of skin eruptions. Skin eruptions caused by drugs usually develop rapidly; therefore, it is generally easy for the patient to remember and give the names of drugs he has taken recently. When asking the patient what drugs he has taken, ask very specific questions such as these:

(1) "Do you take sleeping pills, nerve medicines, vitamins, laxatives, or headache medicines?"

(2) "Have you been given any pills for a recent illness?"

(3) "Did your doctor give you any shots recently?"

c. **Food and Skin Problems.** Some foods cause skin problems. Some individuals get hives or wheals after eating strawberries, shellfish such as shrimp, or any kind of nut. Other people develop skin lesions after consuming alcoholic beverages.

d. **History of the Skin Eruption.** When taking the patient's history, be sure to ask the patient what the skin eruption looked like as it was developing. Obtain this information:

(1) An exact description of the onset of the skin problem.

(2) A careful description of the first skin lesion(s).

(3) The details of the development and extension of the skin lesion(s).

(4) If the skin problem has happened before, ask the patient if he can relate the appearance of skin lesions to any of the factors listed in paragraph 2-2a; common factors such as food, drugs, contact with plants, etc.

e. **Patient's General Medical History.** Although information about the patient's general medical health is not always obtained, it can be of great help in diagnosing and treating a skin problem. Be sure to ask for this information:

(1) Patient's age. Also record his sex and race.

(2) The patient's past medical history: hospital admissions; illnesses; operations; pregnancies; drug sensitivities; hazardous exposure; general health; habits; and diet.

(3) Social history: birthplace; residence; and travel (especially foreign).

(4) Family history: skin diseases; allergies; diabetes; hypertension; bleeding disorders; anemia; and nervous, muscular, intellectual, or emotional disturbances.

2-3. ELEMENTS TO CONSIDER WHILE DOING AN INSPECTION

a. **General.** Consider the skin as a separate organ system; that is, a group of tissues that perform several specific functions. The skin is an organ of relatively unique size. One of its unique features is the large surface area. The size of an adult male skin is roughly equal to a 6 by 3 foot sheet. Skin has many functions. It serves as a sensory organ, as an organ of metabolism having synthesizing, excretory, and absorptive functions; as a protective barrier against the external environment; and as an important factor in temperature regulation. A clinical examination of the skin is an assessment of all these special functions. Additionally, the skin works with internal organs and often reflects diseases in internal body organs. Therefore, the skin is not only an organ with its own special patterns, but it is also a mirror reflecting the condition of the interior of the body.

b. **The Examination.** The examination should be conducted in a well-lighted room. If possible, use natural daylight or a daylight type of artificial light. Begin by a low power scan of the patient's skin as a whole--skin surface, nails, and mucous membranes. Assess color, the degree of moisture, the turgor (normal tension in a cell), and the texture of the skin. Remember that inspection of skin involves looking for changes on the skin surface and changes immediately beneath the surface.

c. **Ultraviolet Light Inspection.** Sometimes skin conditions are best seen under ultraviolet light.

(1) Wood's lamp (black light). This light, developed by R. W. Wood, a United States (US) physicist, is used to diagnose fungal infections. The light filter, made of glass containing nickel oxide, transmits only ultraviolet rays. When placed under this lamp, the fungal lesions on skin with the disease tinea capitis, for example, fluoresce. This ultraviolet light, a black light, allows the doctor to see the skin lesions clearly.

(2) Tinea versicolor. This superficial fungal infection is characterized by scaling, annular red, white, or brown patches. When these patches are viewed under the Wood's lamp, the skin lesions are a gold color. These eruptions are not dangerous but are not pleasant to look at. A physician can diagnose this disease by looking at the lesions, putting potassium hydroxide on the lesions, and examining the lesions under a Wood's light.

2-4. PHYSICAL FINDINGS OF INSPECTION--COLOR

a. **Normal Skin Pigments.** Three elements are responsible for skin color: melanin, a pigment in the epidermis; carotene, a pigment mostly in the dermis; and blood in the capillaries found in the dermis. The amount of melanin causes the skin color to vary from pale yellow to black. Melanin is found primarily in the basale and spinosum layers of the skin and produced in cells called melanocytes. These cells are located either just beneath or between the cells of the stratum basale. The number of melanocytes is about the same in all races. Skin color differences in the races are due to the amount of pigment the melanocytes produce and disperse. An individual without pigment in the skin, hair, or pupils of the eyes is termed an albino. This person has inherited an inability to produce melanin. In other people, melanin has a tendency to form in patches called freckles. Carotene, a skin pigment found in Oriental people, when mixed with melanin accounts for the yellowish hue of Oriental skin. The pink color of Caucasian skin is due to blood in capillaries in the dermis without a heavy pigment in the skin to mask the color. Blood in the capillaries close to the surface of the skin is also responsible for the color of nailbeds, lining of the eyelids, oral mucose, and the underlying vascular bed.

b. **Abnormal Skin Pigments.** Abnormal skin pigments include hyperpigmentation, hypopigmentation, and erythema.

(1) Hyperpigmentation. Excessive pigmentation in the skin is termed hyperpigmentation. Chronic adrenal insufficiency causes hyperpigmentation. A patient may have increased pigmentation over his entire body, appearing to have a very good tan year round. Areas of the body that may become noticeably darker include points of pressure and friction such as elbows, knees, and scars; hair; and lines on the nails.

(2) Hypopigmentation. Not enough pigmentation in the skin is termed hypopigmentation. The striking contrast between skin with pigment and skin without pigment confused people in ancient times, who confused hypopigmentation with leprosy. In the case of vitiligo, there is a loss of pigment in the skin, mucous membranes, and hair bulbs.

(3) Erythema. This term refers to redness of the skin. An individual with a fever will have erythema. Also, sunburned people and those with superficial infections will have reddish-colored skin.

(4) Cyanosis. Cyanosis is a bluish discoloration of the skin, lips, and nail beds caused by insufficient oxygen in the blood. Cyanosis can be caused by congestive heart failure; pneumonia; or congenital heart disease with right-to-left shunts.

(5) Localized red or purple changes to the skin. Vascular neoplasms, birthmarks in Von Recklinghausen's disease, and hemorrhage into the skin can cause the skin to be red or purple colored. Vascular neoplasms change the skin color. Sturge-Weber neoplasms are cherry red in color. A hemangioma (a benign tumor made up of blood vessels) may be port wine colored or bright red as in a senile hemangioma or bright red and raised as in a strawberry birthmark. Birthmarks in Von Recklinghausen's disease are light brown spots on the skin. These spots are sometimes called cafe au lait spots. Spontaneous bleeding in the subcutaneous tissues, another condition, causes the appearance of purple patches on the skin. In petechiae, bleeding into the skin appears as purplish-red spots on the skin, nail beds, and mucous membranes. In ecchymosis, blood from injured vessels escapes and black and blue spots appear on the skin.

(6) Decrease in hemoglobin content. Persons suffering from anemia or shock will have pale skin.

(7) Changes in skin color caused by pigment deposits. In jaundice, the yellow pigmentation of the skin and/or sclera of the eye is caused by the high levels of bilirubin (an orange-red pigment) in the blood. In carotenemia, increased carotene in the blood causes the skin to look yellowish.

2-5. PHYSICAL FINDINGS OF PALPATION

Palpate (examine by touching or pressing) the skin and note the following:

a. **Skin Texture**. Feel the skin to determine whether it is rough and coarse, smooth and fine, or dry as in winter itch. Rough, coarse skin can be an indication of hypothyroidism while smooth, fine skin can be an indication of hyperthyroidism.

b. **Skin Thickness.** There may be increased thickness as in corns and calluses. Decreased skin thickness can be caused by poor blood supply to particular areas or excessive use of steroids.

c. **Elasticity.** This is the ability of the skin to return to its normal position when stretched or pulled. Loss of elasticity occurs most commonly in such areas as the back of the hand and face. An individual who has lost weight rapidly may have loose skin. Skin loses elasticity as part of the process of aging.

d. **Hydration.** If the skin is loose, wrinkled, and lax, it suggests dehydration of the entire body, a condition called turgor. The opposite condition is edema, excess body water stored in the skin. Firm pressure against these fluid-filled areas results in indentation in the skin.

e. **Moisture.** Sweating and oiliness can both cause moisture. Excessive moisture (especially on the palms of the hands and the soles of the feet and under the armpits) may occur in normal people as well as in people who have a fever. A person with cold, clammy skin may have a serious medical condition. Abnormal dryness is noted in people with aged skin, especially during the winter months in temperate climates where the humidity may be low. Dryness may also be associated with large doses of atropine-like drugs.

f. **Temperature.** With the back of your fingers, feel the skin to assess skin temperature. Increased skin temperature can be caused by infection or heat stroke. Decreased skin temperature may occur when there is vascular obstruction, shock, or hypothermia.

2-6. SPECIALIZED PROCEDURES

a. **Bacterial Smears and Cultures.** Identifying the bacteria in skin lesions is very important in determining the cause of the skin lesion and whether the lesion is primary or secondary. Two methods can be used to identify bacteria: Gram's stain and a blood culture. In the Gram's stain method, microorganisms are stained with crystal violet and further treated with other chemicals. The end result is that these microorganisms can be identified as gram- positive or gram-negative. Appropriate treatment can then be determined. Gram's stain is a rapid method of examining a lesion sample for the number and type of bacteria as well as for the character of the inflammatory matter coming from the lesion. Often the Gram stain provides the first clue as to the specific cause of the infection causing the skin lesion(s). If skin lesions are thought to be part of a generalized infection, blood cultures should be taken. Care must be taken to obtain the blood culture from an area in which there are not skin lesions. When gram-stain examination and cultures have been performed, a reliable diagnosis of the cause of the skin lesion can be made and treatment prescribed.

b. **Fungal Smears and Cultures.** There is a tendency in dealing with skin problems where fungus is concerned to minimize the necessity for cultures to confirm the diagnosis. The general impression is that modern antibiotics and antifungal agents can take care of the fungus problem. However, many skin diseases look very much alike so that a clinical diagnosis often needs to be supported by a laboratory diagnosis--a culture. The location of the fungus will determine the type of clinical specimen to be collected: infected hairs for a fungus attacking hair and nail scrapings for a fungus attacking nails. Collecting the appropriate specimen, proper handling and processing, and correct culturing techniques are skills which are generally acquired through practice.

c. **Skin Biopsies.** Skin biopsies are used to diagnose skin conditions that cannot be identified by their appearance or skin conditions that do not respond to treatment. Without a biopsy, it is often impossible to determine whether a skin problem-particularly a mole or other skin lesion that has changed in size or color, or sore that has not healed--is cancerous. A skin biopsy is also used to diagnose some bacterial and fungal skin infections and a number of other skin conditions.

(1) Types of skin biopsies. There are three kinds of skin biopsy: a punch biopsy, a shave biopsy, and an excisional biopsy. In a punch biopsy, a small cylinder of skin, sometimes only a part of the problem area, is removed with a skin punch. In a shave biopsy, the outer portion of the problem area is removed. In an excisional biopsy, the entire problem area of skin (for example, a skin growth) is removed. Results of these biopsies are usually available in seven to ten days. The results of the biopsy will indicate either a benign (noncancerous) or malignant (cancerous) skin condition. Common noncancerous or benign growths include cysts, warts, moles, keloids, dermatofibromas, and neurofibromas. Skin cancers are the most common cancers in humans. Three quarters of skin cancer cases are basal-cell carcinoma, a nonthreatening skin cancer found most frequently on the head and neck. Biopsy specimens can also detect bacterial and fungal infections as well as inflammatory skin diseases.

(2) The procedure.

(a) Punch biopsy. In a punch biopsy, a local anesthetic is injected and the skin around the area to be sampled is pulled taut. A hollow instrument (the punch) is inserted into the skin. The instrument is rotated and circles a "plug" of skin and some underlying fat. The instrument (the punch) is removed, and a forceps or needle is used to remove the plug (the sample). If a large specimen has been removed, the skin may be closed with one or two stitches. If a small specimen was taken, pressure on the area will often control the bleeding.

(b) Shave biopsy. After a local anesthetic is injected, a doctor uses a sharp scalpel to cut the growth off even with the skin. Bleeding is controlled with pressure.

(c) Excisional biopsy. A local anesthetic is injected. The entire lump, spot, or sore is cut out with a scalpel. Usually, the incision is closed with stitches and bleeding is controlled with pressure. If the biopsy is large, a skin graft may be used to cover it.

d. **Patch and Intradermal Tests.**

(1) Allergy testing. Allergies result from a malfunction of the body's immune system, a system that usually protects us from foreign substances. For a person with allergies, his immune system overreacts to normally harmless foreign substances such as pollens, dusts, danders, or foods. The overreaction can cause sneezing, wheezing,

watery eyes, itching, rash, and sometimes even life-threatening anaphylactic shock. Allergy testing is performed to find out what exactly an individual is allergic to. Skin tests are most often done to identify the cause of sneezing, runny nose, and nasal congestion of hay fever or the wheezing of asthma. Patch tests are done to help diagnose unexplained rashes. Allergy tests are usually done by a doctor or technician. The three types of allergy tests are the scratch test, the intradermal test, and the Patch test.

(a) The scratch test. This test is used often because the reaction it can produce is less severe in a person who is highly allergic to substances. In this test, very small amounts of dilute solutions of different suspected allergens (grasses, weeds, trees, molds, dusts, and foods) are placed on the patient's arm or back. The skin beneath the sample is lightly scratched with a sterile pin. After twenty to thirty minutes, the scratched areas are examined for a reaction such as redness, swelling, and blistering. The entire test usually takes about thirty to forty minutes and may be repeated later.

(b) The intradermal test. In this test, small amounts of various suspected allergens are injected into the skin on the patient's arms or back. After twenty to thirty minutes, the injection sites are evaluated for reactions.

(c) The Patch test. Diluted samples of suspected allergens are placed on small pieces of filter paper and taped to the skin on the patient's back. The patches are left in place for twenty-four to forty-eight hours. During this period, the patient should not bathe or engage in any activity that might cause him to sweat and loosen the patches. After the required number of hours, the patches are removed, and any skin reactions under the patches are examined.

(2) Tuberculosis tests. The purpose of a tuberculin skin test is to determine whether the person was ever infected by the bacterium that causes tuberculosis. The individual's immune system will produce swelling at the injection site one to two days after the skin test if that person has been infected with tuberculosis or vaccinated against tuberculosis any time in the past. Two commonly used skin tests are the tine test and the Mantoux test. The tine test uses dried, old tuberculin (OT) on several metal tines embedded in a round plastic head. The tines are pressed against the person's skin, and the antigen enters the dermis layer of skin. This method is convenient and safe for mass surveys. The most accurate method of tuberculin testing is the Mantoux test, which requires injection of antigen into the epidermal skin layer.

2-7. BREAST EXAMINATION

Although breast cancer is a leading cause of cancer death in American women, breast cancer is a disease that can also occur in men. Unfortunately, the causes of breast cancer are not known, so it is not clear how this disease can be prevented. Breast cancer can often be treated successfully if it is detected early, before the cancer spreads.

a. **The Male Breast.** Although carcinoma of the male breast occurs infrequently (about one percent of all male cancer), it does occur. Men should, therefore, be examined for breast cancer regularly. Males are also afflicted with mastitis (inflammation of the breast) and gynecomastia (excessive development of the male breast).

b. **The Female Breast.** The best time for female breast examination is five to seven days after the menstrual cycle. At this time, the breasts are less likely to be swollen and are easier to examine.

c. **Method of Examination.** After you have taken the patient's history, have the patient disrobe to the waist and drape her. Inspect the breasts for symmetry, appearance, nipple retraction, and skin appearance and texture. Notice whether the skin dimples. Next, palpate the breasts. Using the palm of the hand, palpate all areas of breast tissue systematically. Note the elasticity of the nipple and areola (pigmented area around the nipple of the breast). Observe the breasts for the following: consistency, elasticity, absence or presence of tenderness, and masses.

d. **Breast Self-Examination.** Every woman's breasts are different. That is why it is so important to teach each woman how to examine her own breasts. Over ninety percent of all breast cancers are first discovered by women themselves. Women should know to look for changes such as these in their breasts: new wrinkling or dimpling of the skin; retraction of the nipple; puckering of the breast on one side; or a red scaling rash or sore on the nipple. Have any of these checked by a physician.

2-8. CLOSING

Your ability to perform a thorough physical assessment of the integumentary system can provide an excellent diagnostic tool for identifying potentially serious or disabling problems. The condition of a patient's skin often is an indication of other physical problems. Use this tool for the complete assessment of your patient.

Continue with Exercises

EXERCISES, LESSON 2

INSTRUCTIONS. The following exercises are to be completed by writing the answer in the space provided. After you have completed all the exercises, turn to the "Solution to Exercises" at the end of the exercises and check your answers.

1. The patient has a skin problem, and you are taking his history. You ask him about his hobbies, his immediate environment (including plants and animals), and food he has eaten recently. Why?

   _____

   _____

   _____

2. When you are taking a patient's history, why would you ask detailed information about drugs he had taken recently?

   _____

3. Foods which can cause the skin problem urticaria include _____,

   _____, and _____.

4. List two facts the history of a skin eruption should include.

   a. _____.

   b. _____.

5. List two elements of the patient's family history which you should include when you are taking the patient's general medical history.

   a. _____.

   b. _____.

6. _____ is a light which is a valuable aid in diagnosing skin infections such as fungi. This equipment transmits ultraviolet rays which cause the fungi in the skin to fluoresce.

7. _____ is a superficial fungal infection of red, white, or brown patches which are primarily a cosmetic problem rather than a pathological problem.

8. These three methods can be used to diagnose fungal disease: skin evaluation with potassium hydroxide; _____ lamp examination; and examination of skin cultures for dermatophytes.

9. _____, an abnormal darkening of the skin, is often the first sign of adrenal insufficiency.

10. _____ is an abnormal decrease in skin pigmentation.

11. The skin condition _____ is a redness of the skin which occurs with any skin injury, superficial infection, or skin inflammation.

12. List three elements responsible for the skin color in humans.

    a. _____.

    b. _____.

    c. _____.

13. The amount of pigment produced and dispersed by melanocytes accounts for

    _____

14. The pinkish color of nail beds in Caucasians is caused by _____

    _____

15. Carotene mixed with melanin is responsible for _____in Oriental skin.

16. During winter months in an area of mild, low humidity, many people may suffer from excessively _____ skin.

17. To assess the _____ of the skin, grasp the skin between the forefinger and the thumb and pull upward.

18. _____ is characterized by soft skin texture which can be diagnosed by touching the skin.

19. An increase in tissue bilirubin found in the skin is responsible for the yellowish skin color of a person having _____.

20. _____, caused by hemorrhages into the skin, is commonly known as a bruise or a black and blue mark.

21. In addition to modern antibiotics and/or antifungal agents, a _____ smear may be used to diagnose the type of fungus causing a skin problem.

22. A skin test for allergy, the _____ test is performed by applying to the skin a small piece of gauze or filter paper on which a suspected allergy-causing substance has been placed.

23. The male breast, as well as the female breast should be examined periodically because _____

24. The most commonly used tests for the diagnosis of tuberculosis are the _____ test and the _____ test.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. You ask these (and other questions) to try to determine what the patient's skin has been expose to over a period of time. (para 2-2a)

2. Drugs are often the cause of skin eruptions. (para 2-2b)

3. Seafoods.
   Nuts.
   Berries. (para 2-2c)

4. You are correct if you listed any two of the following:

   Exact description of eruption when it began.
   Description of the first lesion.
   Details of the development/extension of the skin lesion.
   Information about the skin problem if it has happened before. (para 2-2d)

5. You are correct if you listed any two of the following:

   Skin diseases.
   Allergies.
   Diabetes.
   Hypertension.
   Bleeding disorders.
   Anemia.
   Nervous disturbances.
   Muscular disturbances.
   Intellectual disturbances.
   Emotional disturbances. (para 2-2(e))

6. The Wood's lamp. (para 2-3c(1))

7. Tinea versicolor. (para 2-3c(2))

8. Wood's lamp. (para 2-3c(1))

9. Hyperpigmentation. (para 2-4b(1))

10. Hypopigmentation. (para 2-4b(2))

11. Erythema. (para 2-4b(3))

12. Melanin.
    Carotene.
    Blood in capillaries. (para 2-4a)

13. Skin color differences in the races. (para 2-4a)

14. Blood in the capillaries close to the surface without a heavy pigment to mask the color. (para 2-4a)

15. The yellowish hue or color. (para 2-4a)

16. Dry. (para 2-5e)

17. Turgor. (para 2-5d)

18. Hyperthyroidism. (para 2-5a)

19. Jaundice. (para 2-4b(7))

20. Ecchymosis. (para 2-4b(5))

21. Fungal. (para 2-6b)

22. Patch. (para 2-6d(1)(c))

23. Men as well as women can have breast cancer. (para 2-7a)

24. Tine.
Mantoux. (para 2-6d(2))

End of Lesson 2

LESSON ASSIGNMENT

LESSON 3	Primary and Secondary Skin Lesions.
LESSON ASSIGNMENT	Paragraphs 3-1 through 3-5.
LESSON OBJECTIVES	After completing this lesson, you should be able to:
	3-1. Identify different configurations of skin lesions.
	3-2. Identify the types of skin lesions.
SUGGESTION	After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 3

PRIMARY AND SECONDARY SKIN LESIONS

3-1. INTRODUCTION

Skin conditions are a leading cause of lost man hours in the US Army. During World War II, more US military were evacuated from the South Pacific for skin diseases than for battle casualties. In everyday life, relatively minor-appearing skin diseases have a major impact on a person's occupation and professional activities. Fissured, dry skin on the hand, for example, can disable a skilled surgeon or mechanic. This lesson will enable you, the Medical NCO, to become acquainted with primary and secondary skin lesions.

3-2. EFFECTS OF SKIN LESIONS

The skin serves as an excellent indicator of general health. Even someone who is not medically trained can see cyanosis, jaundice, pale skin, and changes in skin pigmentation. An individual trained to recognize more subtle changes in the skin can contribute a great deal to a person's general well being. Skin lesions can have a variety of effects on a person. Skin lesions are abnormal changes in the skin; changes which can be detected by sight or touch. Some skin lesions are life-threatening; for example, burns, malignant melanomas, and severe allergies. Other skin lesions may disturb normal skin functions. The skin plays a major role in maintaining a person's homeostasis (keeping body temperature relatively constant); skin lesions may disturb this function. Additionally, skin lesions may indicate that the person has some internal health problem; for example, hepatitis and endocrine problems exhibit skin lesions. And, finally, skin lesions that are ugly to look at can cause the individual psychological distress and social problems. People often stare at the individual and register feelings from amusement to disgust. If the skin is weeping, red, raw, discolored, peeling, or scaly, the public may consider the person ugly or dirty and withdraw from him. In turn, the sufferer may withdraw emotionally and physically, altogether a bad situation and all the more reason to find out the cause of a skin lesion.

3-3. DIFFERENT CONFIGURATIONS OF SKIN LESIONS

The process of diagnosing skin problems and diseases consists of several steps. First, the lesion(s) must be identified as early as possible. The shape of a single lesion should be noted. If there are several lesions, the arrangement of the lesions in relation to each other and their pattern of distribution should be observed. Diagnosis often depends on the shape, arrangement, and distribution of skin lesions.

a. **Annular (Ring-Shaped).** These ring-shaped lesions have a margin that is active and continues to grow. The center is usually clear. Ringworm is an example of such a lesion.

b. **Imbricated (Overlapped).** The edges of these skin lesions overlap.

c. **Geographic (Resembling Continents and Islands).** These skin lesions have highly irregular borders which resemble a geographic formation such as a continent. The most common example is hives.

d. **Polycyclic (Multiple Rings).** Skin lesions of this classification appear in groups of round circles.

e. **Serpiginous (Creeping from Part to Part).** This is the type of skin lesion which heals at one margin while spreading on the opposite side.

f. **Target (Resembling a Wheal).** A target lesion, also called an iris lesion, has two or three concentric circles. Erythema multiforme, an acute inflammatory skin disease, is an example of target lesions. See figure 3-1.

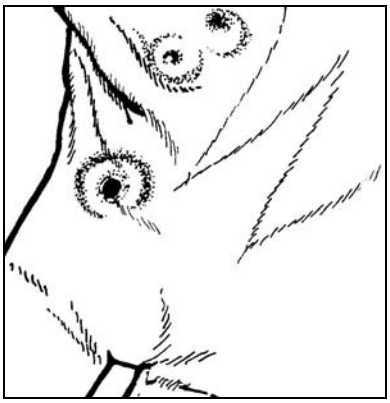

Figure 3-1. Erythema multiforme.

g. **Verrucose (Wart-like).** These lesions are small, usually hard lesions which are higher than the skin. A common wart, verruca vulgaris, is an example of this type of lesion. See figure 3-2.

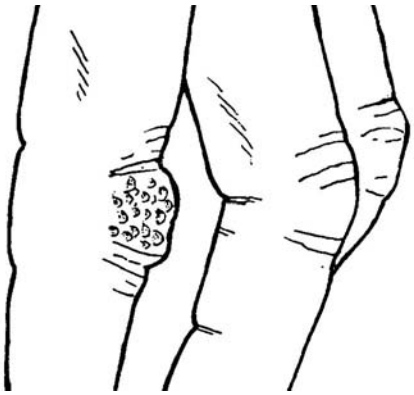

Figure 3-2. Verruca vulgaris.

3-4. TYPES OF SKIN LESIONS

a. **General Information**. Generally, while the epidermis plays a leading role in the skin by being the barrier between the human's internal tissues, and so forth, and the environment, the dermis is the more indispensable. Of the two layers, the dermis is much thicker and measures up to four mm in depth. The dermis is composed of collagenous and elastic tissues. These tissues provide the structural base for the epidermis as well as a site for vascular and nerve networks in the skin. Alteration in any component of the skin-- epidermis, dermis, or any skin appendage--can result in clinically visible skin lesions.

b. **Types of Skin Lesions.** Skin lesions can be divided into three categories: primary skin lesions, secondary skin lesions, and special skin lesions. Primary skin lesions are basic and simple. Secondary skin lesions result from complications of primary skin lesions.

c. **Primary Skin Lesions.**

(1) Macule. A macule (figure 3-3) is a definite area of skin in which the skin color has changed from the normal skin color. This area is neither higher nor lower than the surrounding skin area. These flat, discolored spots are either hypopigmented (abnormally diminished in pigmentation) or hyperpigmented (abnormally increased in pigmentation). The lesions are of varied size, less than one milliliter in diameter. Macules may be adjacent to each other and cover a whole extremity (for example, a leg) or half of the face (as in the disease capillary hemangioma). Macules may be cafe au lait colored (color of coffee with milk) as in Albright's syndrome, blue to black as in urticaria (hives), or white as in certain forms of leprosy.

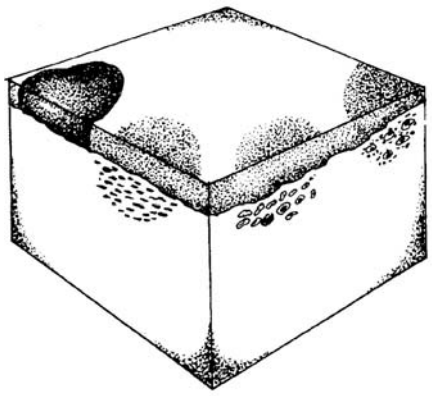

Figure 3-3. Macule.

(2) Papule. A papule (figure 3-4) is a solid, elevated lesion usually 0.5 cm to 1 cm or less in diameter. Most of the lesion is above the level of the surrounding skin rather than deep within the skin. Many skin diseases start with papules--warts, psoriasis, syphilis, drug eruptions, and some phases of acne. Different types of papules are different colors. The papules of psoriasis are flat-topped and red, often with a

superimposed scale that produces bleeding when removed. Skin lesions of a secondary syphilis are copper colored. Violet papules are typical of lichen planus skin lesions, and the papules of lichen sclerosis are whitish. Rounded, red, bluish-red, or brownish-red papules characterize the skin disease pyogenicum.

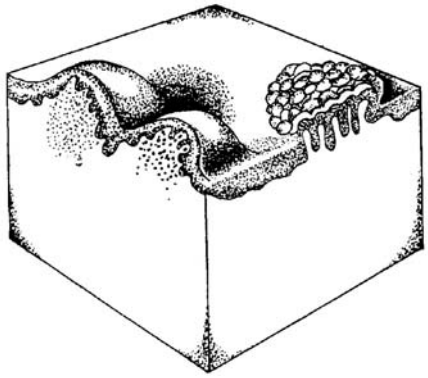

Figure 3-4. Papule.

(3) Nodule. A nodule (figure 3-5) is a solid, elevated lesion that extends deeper into the dermis than the papule. A nodule is greater than 0.5 cm in diameter but less than 2 cm and may or may not be elevated above the level of the surrounding skin. Examples of nodules include keratinous cysts, small lipomas (benign tumors composed of mature fat cells), fibromas (benign tumors derived from fibrous connective tissue), some types of lymphoma (malignant diseases usually in the lymph nodes), and a variety of neoplasms (abnormal, excessive, and uncontrolled multiplication of cells forming a mass or new growth of tissue). Nodules are often an indication of systemic disease and can result from inflammation, neoplasms, or metabolic deposit in the dermis or subcutaneous tissue. For example, nodules are present in late syphilis, tuberculosis, and roundworm infestation. Sometimes local agents can produce nodules--foreign-body reactions, milker's virus, or tick bites.

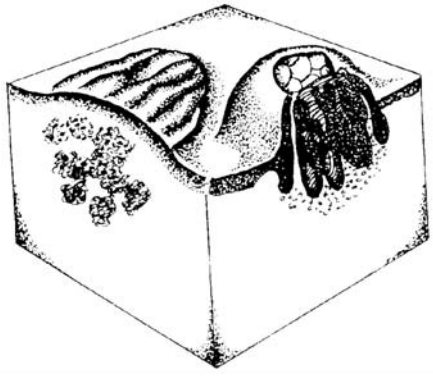

Figure 3-5. Nodule.

(4) Tumor. A tumor is an elevated, solid lesion greater than 2 cm. Tumor, a general term for any mass, benign or malignant, is sometimes used to indicate a large nodule. The skin is an extremely common site for a wide variety of tumors; most are easily visible in the earliest stages. Therefore, it is possible to recognize and eradicate tumors in almost 100 percent of the cases. The following are a few of the origins of skin tumors: tumors arising from the epidermis surface; tumors arising from epidermal appendages such as hair structures, sebaceous glands, and sweat glands. Examples of common skin tumors are actinic keratoses, usually caused by repeated exposure to sunlight over the years. These tumors are frequently noted in middle-age sailors, sportsmen, and farmers. Actinic keratoses are more common in the Southwestern US than in areas with less sunlight. Fair-skinned people are more susceptible to these tumors than those with dark skin. People who are bald frequently develop multiple actinic keratoses.

(5) Wheal. A wheal (figure 3-6) is an elevated lesion (rounded or flat-topped). A wheal has increased tissue fluid, often itches, and usually disappears within a few hours. Trace the wheal with a skin marking pencil, observing over a period of time. You will see the lesions shift rapidly from involved to uninvolved adjacent skin areas. The lesions are the result of excess fluid in the upper layer of the dermis. Wheals are pale red and may be an allergic response to any one of a number of irritants or to insect bites. Twenty-five percent of the normal population can produce wheals merely by stroking their skin. This phenomenon is called dermatographism. The size of wheals varies from 3 to 4 mm in diameter as in the skin disease cholinergic urticaria or 10 to 12 mm as in the skin diseases composed of erythematous plaques.

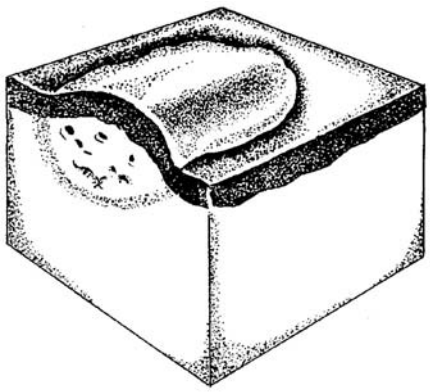

Figure 3-6. Wheal.

(6) Plaque. A plaque (figure 3-7) is a rather large surface area which is elevated above the surrounding skin surface. In the skin disease psoriasis, a number of papules form the plaque. In the skin disease lichenification, the skin on the plaque appears thickened, and the skin markings are more visible than usual. Also, the surface of the skin lesions may resemble tree bark. Lichenification is caused by repeatedly rubbing a skin area.

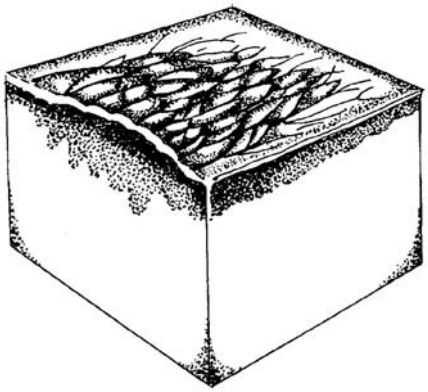

Figure 3-7. Plaque.

(7) Vesicle and bulla. A vesicle (figure 3-8) is an elevated, fluid-filled skin lesion that is less than 0.5 cm in diameter. A bulla is the same as a vesicle with the exception that the bulla is greater than 0.5 cm in diameter. A vesicle or bulla arises from a cleavage at various levels of the skin. When the cleavage is just beneath the stratum corneum of the skin, a subcorneal vesicle or bulla results as in impetigo and corneal pustular dermatosis. Sometimes the vesicle or bulla walls are so thin that you can see through them. In such instances, the serum, lymph, blood, or extracellular fluid is quite visible.

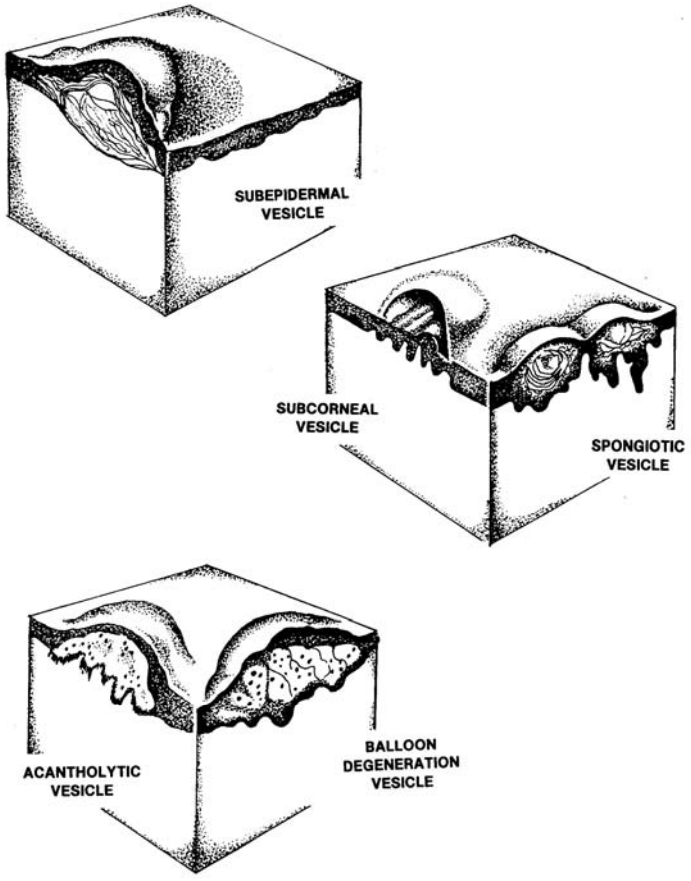

Figure 3-8. Types of vesicles.

(8) Pustule. A pustule (figure 3-9) is a pus-filled lesion that can result from infection of vesicles or bullae. The pus is a thick fluid composed primarily of dead white blood cells (leukocytes) and a thin liquid and often the microbiologic agent responsible for the inflammation. The pustule may appear white, yellow, or greenish-yellow, depending on the color of the material being deposited in the tissue. An example of a common pustule is a follicular or hair pustule. Hair pustules are usually shaped like a cone, have a hair in the center, and heal without scarring.

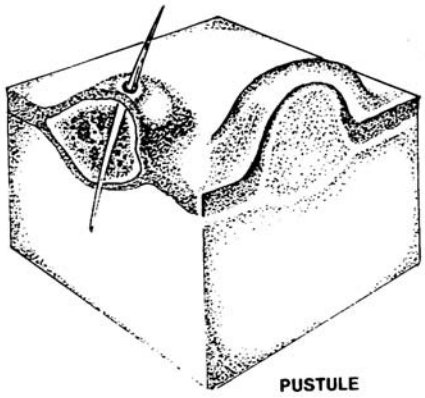

Figure 3-9. Pustule.

d. **Secondary Skin Lesions.** Secondary lesions are the result of some primary lesion. A number of conditions such as crust and scale are characteristic of secondary lesions.

(1) Crust. The dried residue of fluid, blood, or pus on an area of lost or damaged skin surface is crust (figure 3-10). Crusts may be thin, delicate, and easily torn or damaged or the crust may be thick and sticking to the skin. Crusts formed from dried serum (the clear fluid of blood) are yellow while crust formed from pus are yellow-green, and crusts formed from blood are dark red or brown. When dealing with crust, it is most important to determine what is underneath the crust--dermatitis, superficial infection, or ulcer.

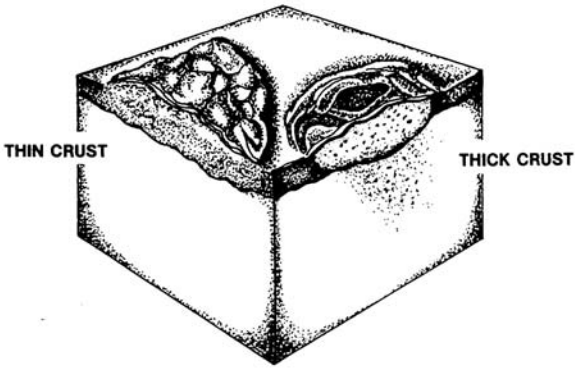

Figure 3-10. Crust.

(2) Scales. Scales are a buildup of dry cells (horny layer) that is higher than usual. Although there are a large variety of scales, some are so distinctive that they can be used to diagnose specific skin problems. For example, a chronic plaque-like scale that is silvery-white to gray is usually psoriasis. Greasy, yellowish scales may indicate seborrheic dermatitis. If the scales are dry and diffuse and look like fish scales on the lower legs, the skin disease is icthyosis. Skin lesions of pityriasis rosea and tinea corpis scale mainly at the edge of individual lesions.

(3) Fissure. A fissure is a crack in the epidermis extending into the dermis. They are linear cleavages in the skin, sometimes very painful. These cracks occur particularly in the hands and feet, especially after therapy has caused excessive drying of the skin. Fissures also occur at the angles of the mouth.

(4) Erosion. A loss of epidermis that does not extend into the dermis is termed erosion. Erosion is often seen in herpes infections.

(5) Ulcer. An ulcer (figure 3-11) is a skin lesion in which there has been destruction of the epidermis and the upper papillary dermis. An ulcer always results in a scar. To determine the cause of an ulcer, note the ulcer's location, borders, base, discharge, and any associated features of the lesion such as nodules, excoriations (scratch marks), varicosities (abnormal swellings), hair distribution, presence or absence of sweating, and adjacent pulses. There are many causes of ulcers--skin trauma of all kinds (heat, cold, electrical, chemical); bacterial, viral, and fungal infections; parasitic infestations; and tumors to name just a few.

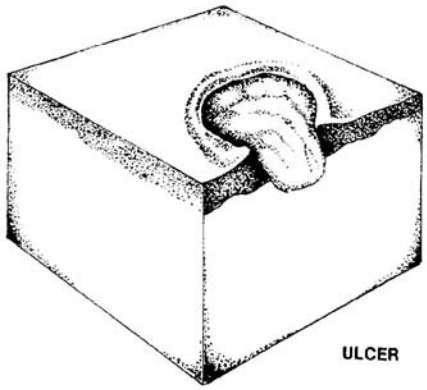

Figure 3-11. Ulcer.

(6) Scar. A scar (figure 3-12) is a fibrous healing of a wound, healing that replaces the normal dermis and epidermis that have been damaged. Scars in different areas of the body may look different. Hypertrophic scars (scars with excessive fibers) result when a lot of collagen is produced in the healing process. This type of scar may occur in the course of acne, herpes zoster, and porphyria (a disorder of blood pigment metabolism). In atrophic scars, the epidermis is thin and usually has neither skin lines nor appendages. This type of scar may be depressed.

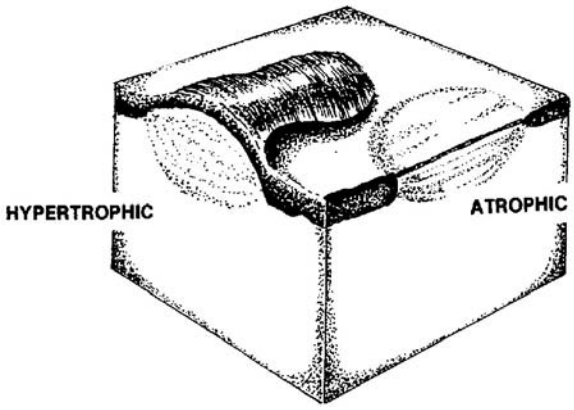

Figure 3-12. Scar.

(7) Keloid. A keloid appears in an area of injury or just arises spontaneously; it is a smooth overgrowth of fibroblastic tissue (tissues composed of spindle-shaped cells). A typical keloid is first noticeable as a small, fairly firm nodule and slowly becomes a marked, several-lobe mass of a dark brown color. The keloid has spontaneous burning, itching, and tingling. Keloids are more frequent in blacks.

(8) Atrophy. Skin atrophy (figure 3-13) is a thinning and wrinkling of the epidermis often seen in the aged. Another type of skin atrophy is the stretch marks seen in the skin of women who have been pregnant or in the skin of people who have had a large weight loss. Glistening white bands in the skin are typical of these stretch marks, the bands having been caused by overstretching and weakening of the elastic tissue of the skin.

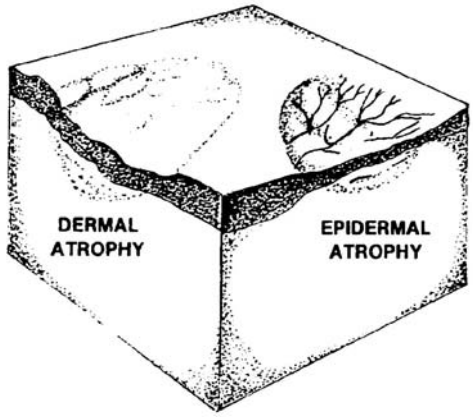

Figure 3-13. Atrophy.

e. **Special Skin Lesions.**

(1) Comedo (blackhead). A comedo or blackhead develops when sebaceous glands become enlarged because of accumulated serum. Blackheads more commonly happen during adolescence and are usually found over the face, chest, and

back. The color of blackheads is caused by melanin and oxidized oil, not dirt. A blackhead is of cosmetic rather than medical importance. The contents of the lesion may be removed with an extractor that takes out the plug and improves cosmetic appearance. Often, however, the blackhead returns in full flower within a month.

(2) Milia (whitehead). A milia or whitehead occurs when a sebaceous duct is blocked with horny materials. These skin lesions, of cosmetic importance only, are small, superficial, keratinous cysts. To remove these cysts, make a small opening with a scalpel and remove the cyst with a comedo extractor.

(3) Sebaceous cyst. A sebaceous cyst forms as a result of a blocked sebaceous duct which continues its activity. In puberty, the growth-pattern of sebaceous glands changes often cause an increase in sebaceous cysts.

(4) Wen. A wen is a common type of epidermal cyst, a sebaceous cyst, found on the scalp or scrotum. This type of sebaceous cyst is a slow-growing cyst containing follicular, keratinous, and sebaceous material. When palpated, the cystic mass is firm, globular, moveable, and nontender. It seldom causes discomfort unless it is infected. When punctured, the contents of the cyst are found to be cheesy, often fetid formed of epithelial debris and greasy material with soft keratin present. Sometimes, calcium deposits may be found. If the wen is small, the contents may be expressed by making a tiny stab incision. If the wen is large, a small incision can be made and the contents evacuated. Then, remove the cyst wall with a curette or hemostat. The wall of a large cyst must be removed to prevent recurrence of the cyst.

(5) Folliculitis (ingrown hair). Usually caused by Staphylococcus aureus, folliculitis is a superficial or deep bacterial infection and irritation of the hair follicle. The lesion is made up of a superficial pustule or inflammatory nodule surrounding a hair. Infected hairs can be easily removed. When the hair follicles are deep in the skin (for example, the bearded region), folliculitis may become chronic. Stiff hairs in the bearded area of the skin may come out of the hair follicle, curve, and reenter the skin. This produces a chronic, low-grade irritation without major infection. To prevent folliculitis, aggravating factors or irritations must be corrected.

(6) Furuncle (boil). A furuncle is a deep-seated infection with a single core; the infection involves the entire hair follicle and adjacent subcutaneous tissue. This lesion becomes a pustule 5 to 30 mm in diameter with central necrosis that discharges a core and liquid. Furuncles usually occur in hairy parts of the body where there is irritation, friction, pressure, moisture, or oily skin. Although furuncles occur frequently on the neck, breasts, face, or buttocks, these skin lesions are most painful when they occur in skin that is closely attached to underlying structures; for example, the nose, ear, or fingers. Furuncles can occur over and over, often in healthy young people.

(7) Carbuncle. A carbuncle is a staph infection with multiple tracts (several furuncles) that extend into the subcutaneous tissue. The furuncles have developed in adjoining hair follicles, developing more slowly than one furuncle and sometimes

accompanied by fever and prostration. The infection causes pus to be produced and drain from the furuncles. Carbuncles develop most frequently in males occurring commonly on the nape of the neck.

(8) Abscess. An abscess is a localized collection of pus, usually caused by bacterial infection, in tissues, organs, or confined spaces. Abscesses in cutaneous or subcutaneous skin layers are evident by swelling, tenderness, and redness over the affected site. The patient may experience fever if the infection is spreading. Usually, the contents of an abscess must be removed for healing to take place. The abscess sometimes ruptures spontaneously into adjacent tissue or outside the body.

(9) Telangiectasia. This skin lesion is a small cluster of dilated blood vessels. Fine, bright red lines or net-like patterns may be seen on the skin. Usually not elevated, these skin lesions can be found around the nail bed, on the face and trunk. Telangiectases are common on the face of people who are in the sun and wind a great deal.

(10) Petechiae. A petechia is a small hemorrhage under the skin. This lesion appears as a nonraised, purplish-red spot on the skin, nailbeds, or mucous membranes.

(11) Ecchymosis. This is a ruptured vein commonly called a bruise. It is a black and blue spot on the skin caused by the escape of blood from injured blood vessels.

(12) Maceration. Maceration is a softening of solid tissue by soaking. The tissue turns white and breaks down easily.

(13) Burrow. A burrow is a tunnel or linear train in the epidermal layer of the skin caused by a parasite. The contagious, parasitic skin disease scabies is a good example of a parasite burrowing. The skin damage is caused by the female Sarcoptes scabiei who excavates a burrow in the stratum corneum layer of the epidermis, lays her eggs and dies. The larvae emerge, moult, and the females are fertilized. The most common sites in which the parasite enters the skin are between the fingers, the hands, and the wrists. The infection can persist for months or years if a person is not treated, a situation which gave rise to the expression "the seven-year itch."

(14) Excoriation. Loss of skin due to scratching is called excoriation. The implication is that the person has scratched himself, but the scratch mark can also be of unknown origin.

3-5. CLOSING

Most skin lesions are easily treated and can be managed with creams and ointments, especially if they are detected and treated in the early stages of their development. You have learned about a few basic primary and secondary skin lesions, some of which require treatment, and some that require no treatment.

Continue with Exercises

EXERCISES, LESSON 3

INSTRUCTIONS. The following exercises are to be completed by writing the answer in the space provided. After you have completed all the exercises, turn to the "Solution to Exercises" at the end of the exercises and check your answers.

1. Define skin lesions_____

   _____

2. List three general kinds of skin lesions that are life-threatening.

   a. _____

   b. _____

   c. _____

3. A skin lesion that is annular is _____ shaped while geographic skin lesions are shaped like _____.

4. A wart-like skin lesion can be called _____ in terms of configuration or shape, and a skin lesion which resembles a wheal can be identified as _____ shape.

5. A comedo (blackhead) becomes dark because _____

   _____.

6. A _____ is a common type of epidermal cyst found on the scalp.

7. A deep-seated infection involving the entire hair follicle and adjacent subcutaneous tissue is called a _____.

8. The term for the softening of tissue by soaking, the tissue then turning white and easily breaking down is _____.

9. A flat, discolored spot (of less than 1 cm in size) which may be hypopigmented or hyperpigmented is called a _____.

10. An elevated lesion with increased tissue fluid usually associated with itching, sometimes an allergic response to insect bites is called a _____.

11. An individual has a cleavage at the epidermal/dermal interface. A skin lesion--elevated, fluid-filled, and less than 0.5 cm--arises out of this cleavage. This skin lesion is called a _____.

12. A _____ is a smooth overgrowth of spindle-shaped cells; the growth sometimes occurs in an area of injury.

13. A crack in the epidermis extending into the dermis and frequently seen at the angles of the mouth is a _____.

14. _____ is loss of the epidermis that does not extend into the dermis; a skinned knee being an example.

15. A solid, elevated skin lesion that extends deeper into the dermis than a papule and is between 0.5 cm and 2 cm is called a _____.

16. A number of wheals form the _____, the lesion that is characteristic of the skin disease psoriasis.

17. An excavation into the dermis or deeper, a skin lesion which always leaves a scar, is called _____.

18. _____ is a "black and blue spot" caused by the escape of blood from injured blood vessels.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 3

1. Skin lesions are abnormal changes in the skin, changes which can be detected by sight or touch. (para 3-2)

2. Malignant melanomas.
   Burns.
   Severe allergies. (para 3-2)

3. Ring.
   Continents and islands. (paras 3-3a and c)

4. Verrucose.
   Target. (para 3-3f and g)

5. The melanin and accumulated sebum in the enlarged pore oxidize and turn dark. (para 3-4e(1))

6. Wen. (para 3-4e(4))

7. Furuncle. (para 3-4e(6))

8. Maceration. (para 3-4e(12))

9. Macule. (para 3-4c(1))

10. Wheal. (para 3-4c(5))

11. Vesicle. (para 3-4c(7))

12. Keloid. (para 3-4d(7))

13. Fissure. (para 3-4d(3))

14. Erosion. (para 3-4d(4))

15. Nodule. (para 3-4c(3))

16. Plaque. (para 3-4c(6))

17. An ulcer. (para 3-4d(5))

18. Ecchymosis. (para 3-4e(11))

End of Lesson 3

LESSON ASSIGNMENT

LESSON 4	Common Skin Diseases.
LESSON ASSIGNMENT	Paragraphs 4-1 through 4-6.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

4-1. Identify the skin diseases pertaining to common dermatoses and their treatment.

4-2. Identify the diseases pertaining to viral infections and their treatment.

4-3. Identify bacterial infections of the skin and their treatment.

4-4. Identify fungal infections of the skin and their treatment.

4-5. Identify disturbances of hair growth and their treatment.

SUGGESTION After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 4

COMMON SKIN DISEASES

4-1. INTRODUCTION

Skin conditions are very common. They are a constant concern for the patient and the medic. Usually, more than one-third of the overall sick call load is related to skin conditions. The single most contributing factor to skin diseases is poor personal hygiene. Educating the troops is the best preventive measure for skin diseases. As you read this lesson, remember that the soldiers in your unit will depend on your expertise for the prevention and treatment of skin conditions. Also, remember the adage, "If it is wet, use a wet dressing, and if it is dry, use a salve." This saying is true for the majority of skin diseases.

4-2. SKIN DISEASES PERTAINING TO COMMON DERMATOSES

a. **Eczema.**

(1) Definition/characteristics. Eczema is the general name for a group of noncontagious inflammatory skin diseases. These diseases have a tendency toward erythema (redness of the skin), swelling edema (presence of abnormally large amounts of fluid in the intercellular tissue spaces), vesiculation (small bladder or sac containing fluid), oozing, weeping, and crusting with itching. Eczematous dermatoses are those skin diseases where changes seen in eczema are apparent. Nummular eczema are round, coin-shaped lesions. These lesions are most commonly found on extremities near or on surfaces where muscles extend joints, shoulders, and buttocks. The cause of nummular eczema is not known. It is proven that winter, bathing, and soaps aggravate this skin condition. Hand eczema has the characteristics of scaling, crusting, and fissuring (grooving). The dorsa (back) of the hands is a common location. A common cause of hand eczema is prolonged contact with soaps and detergents. Ear eczema (otitis externa) is usually found on the external auditory canal, and seborrheic dermatitis (dry, moist, or greasy scaling) is normally found in the same area.

(2) Treatment. To treat eczema, you should apply cold, wet compresses and antipruritic medications (agents that relieve itching, burning, and pain). Air dry the area and use bland dusting powders. Apply topical antibiotics for secondary infections. If neomycin is used, be aware that the patient may become sensitive to the drug (experience excessive skin reactions) and use of the drug may need to be discontinued. Another medication that can be applied topically is a steroid cream (with hydrocortisone one percent). Refer all cases that are chronic or acute and unresponsive to conservative topical therapy to a medical doctor. Treat all underlying diseases, if present.

b. **Contact Dermatitis.**

(1) Definition/characteristics. Contact dermatitis is an acute or chronic inflammation often sharply marked. This abnormality is produced by substances coming into contact with the skin. People most susceptible are blondes, redheads, and light-skinned individuals. Contact dermatitis is a toxic, allergic, photoallergic (reaction-increased-by-light) condition, and may or may not be limited to the point of contact. Contact dermatitis can be caused by touching these common items: plants (poison ivy, oak, sumac), chemicals, cosmetics, fabrics, and such household items as detergents, waxes, and polish. The effects of touching any of these substances may be immediate or delayed according to how sensitive a person is to the particular substance. The skin area that the offending substance has touched will be itching and red and will have burning blisters. In later stages, oozing or crusty areas are common.

(2) Treatment. No treatment is effective unless the offending agent is removed. Use cool soaks. Apply bland compresses and a drying corticosteroid medication during the period when skin lesions are acute. Be careful not to use hydrocortisone medication for a long period; this drug can cause disabling conditions.

c. **Psoriasis.**

(1) Definition/characteristics. Psoriasis is a common skin disease caused by gene combination. Skin lesions are discrete- pink or dull-red. Patches of thick skin with a red base and white-silvery scales or flakes are present. Psoriasis usually occurs at the elbows, knees, scalp, back, or penis. The condition is worse if the area is exposed to sunshine too long; however, a small amount of sunlight is helpful.

(2) Treatment. There is no known cure for psoriasis, but the following treatment can be administered to provide temporary relief. Apply hydrocortisone cream (one to two percent) four times daily. Mild sunlight and a warm climate have a favorable effect, but humidity makes the condition worse. Kenalog® spray and vitamin E are also helpful.

d. **Acne.**

(1) Definition/characteristics. Acne is a chronic inflammatory disease of the sebaceous glands and hair follicles. It is caused by excessive oils due to hormone stimulations, bacteria, and family history. Commonly affected areas are the face, back, and chest. Skin lesions are multiple spreading pimples, cysts, and painful nodules. In many cases, pus develops.

(2) Treatment. There are pros and cons about a number of foods contributing to acne. Since acne is usually chronic for a number of years (ranging from 1 to 15), certain foods may be eliminated from the diet. Eliminate one or two foods for not less than three weeks and notice whether the skin condition has improved.

Generally, chocolate, nuts, and carbonated cola beverages should be eliminated from the diet. Additionally, give the patient vitamin A for a 3-month period with a 1-month interruption to avoid hypervitaminosis (an excess of the vitamin). Also, apply drying lotions such as white lotion or commercially prepared lotions containing sulfur and resorcinol. DO NOT USE greasy ointments. In some cases, applying a corticosteroid lotion is valuable. Tetracycline is the most beneficial antibiotic, but it must be monitored carefully. Taking oral contraceptives are said to help some young women with acne.

e. **Pityriasis Rosea.**

(1) Definition/characteristics. This is a skin disease that is characterized by granular scales. The disease is noncontagious and is seen most frequently in young adults. The number of cases of this skin disease is highest during spring and fall in temperate climates. The skin lesions are red, oval, scaly patches on the neck and elbow. Spontaneous remission of the disease usually occurs in six weeks, but the skin eruptions may last two months or more.

(2) Treatment. Obtaining a suntan helps the patient's appearance but does not help the disease. Cool baths and application of oatmeal and caladryl lotion help reduce itching.

f. **Sebaceous Cysts**.

(1) Definition/characteristics. Sebaceous cysts are round, globular, cutaneous (skin) or subcutaneous (under the skin) tumors. These tumors rise from the sebaceous glands, usually on the face, neck, scalp, back, and genitalia. The cysts are caused when a gland closes off. When the gland closes, small, hard nodules (cysts) form at the hair follicles.

(2) Treatment. There is usually no treatment unless the cysts are large, annoying, or infected. In such cases, follow this procedure: Remove the cyst surgically including the epithelial wall so that the cyst will not reform. Administer antibiotics to treat the infection.

g. **Seborrheic Dermatitis.**

(1) Definition/characteristics. Seborrheic dermatitis is an acute or chronic papulosquamous dermatitis (scaly dandruff) with or without redness of the skin. It usually affects the scalp, face, the area of the sternum, interscapular (shoulder blade) area, umbilicus, and body folds. Genetic factors as well as climate seem to affect the number of cases of this disease. Stress, hormones, nutrition, and infection cause the disease to become more severe. Seborrheic dermatitis is associated with overactive sebaceous (oil) glands of the skin. This skin condition is usually apparent as dry or oily scaling of the skin or scalp sometimes accompanied by itching. Redness, fissuring, and secondary infection may be present, and the affected area may become acutely inflamed and weeping. Intertriginous dermatitis, lesions in the skin folds, may develop.

Typically, lesions are yellowish, greasy scales or flakes that resemble potato chips. This condition tends to be recurring and last throughout the patient's life. Individual outbreaks of the disease may last weeks, months, or years. Seborrheic dermatitis is frequently found closely associated with common acne. Both skin conditions should be treated at the same time.

(2) Treatment. The patient should eat a well balanced diet, restricting excess sweets, spices, hot drinks, and alcoholic beverages. Urge him to maintain regular working hours, get adequate sleep and recreation, and observe standards of simple cleanliness. Living in this manner should relieve such factors as infections, overwork, stress, constipation, and dietary abnormalities--all of which cause the disease to worsen. Steroids, creams or lotions, may be applied to the skin lesions.

CAUTION: Potent fluorinated corticosteroids used regularly on the face, however, may produce steroid rosacea (superficial inflammation resembling acne). Selsun®, Fostex®, and Sebulex® may be used to treat seborrheic dermatitis of the scalp. Do not overuse Selsun because it can cause baldness. If seborrheic dermatitis in the skin folds is being treated, apply astringent wet dressings followed by three percent vioform and one percent hydrocortisone base.

h. **Urticaria (Hives).**

(1) Description/characteristics. Urticaria is an acute or chronic inflammatory skin reaction of an allergic origin with eruptions of evanescent (unstable) wheals or hives. Hives are caused by ingesting food or drugs. An acute case lasts less than six weeks. A chronic case lasts longer than six weeks. Common causes of hives include eating shellfish, strawberries, eggs, and chocolate as well as using penicillin medications or serum vaccines.

(2) Treatment. Avoid re-exposure to sensitizing drugs or foods and look for the drugs and foods that caused the hives. Eliminate these drugs and foods. Give epinephrine 1:1000 in the dosage 0.3-1.0 ml sc if laryngeal spasm is suspected. Administer antihistamines for prompt and sustained relief of symptoms.

i. **Nevi (Mole).**

(1) Description/characteristics. A nevi is a congenital, discolored spot which is elevated above the surface of the skin. The cause of these skin lesions is unknown. Nevi are dome-shaped, flat, or elevated papules with brown or black colored flesh. They are often hairy and appear on any part of the body. Nevi usually appear during childhood, usually on the palms, soles, and genitalia. They may be the precursor to malignant melanoma.

(2) Treatment. All suspicious lesions of this type should be examined by a dermatologist for surgical removal and biopsy.

j. **Keloid.**

(1) Description/characteristics. A keloid is a mass of fibrous tissue overgrowth at the site of a burn or skin wound. These growths occur more frequently in Blacks. A keloid is a firm, elevated, whitish or reddish elastic nodule of scar tissue. It is common for keloids to have crab-like projections. Their surface is smooth, glistening, and hairless.

(2) Treatment. Keloids are treated by surgical removal, x-rays, and intralesional corticosteroid and hyaluronidase injections.

k. **Basal Cell Cancer Lesions.**

(1) Description/characteristics. These skin lesions are single or multiple, elevated, waxy nodules with pearly, rooted borders. In the later stages, the lesions may become ulcerous. These lesions are most frequently found on areas of the body which are exposed to the sun: the scalp, face, neck, and ears.

(2) Treatment. Basal cell cancer lesions can be treated by removing them surgically or by x-ray therapy. Fair-skinned people can prevent these lesions from forming by wearing sunscreen lotions.

l. **Malignant Melanomas.**

(1) Description/characteristics. Malignant melanomas are highly malignant tumors of the skin or mucous membranes. These tumors may metastasize (transfer) to any organ of the body. They occur more frequently in women, fair complexioned individuals, and people between the ages of thirty and sixty. Incidence is increased with great ultraviolet light exposure. The lesions are usually brown, pink, black, or purple nodules ("red, white, and blue"). These tumors are sometimes flat.

(2) Treatment. Malignant melanomas may be removed surgically or exposed to chemotherapy or immunotherapy.

m. **Drug Eruptions.**

(1) Description/characteristics. Skin lesions can be caused by drugs. The skin eruptions are usually small, red maculae, papules, vesicles, or wheals. The onset is sudden, and itching may be severe. The lesions are generally widespread and symmetric in distribution. Almost any systemically administered medication may produce a skin eruption: penicillin, antibiotics, salicylates, and barbiturates.

(2) Treatment. Follow this treatment for drug eruptions. Find the cause. Which drug caused the skin eruptions? Discontinue the medication. Administer antihistamines; they may be helpful. For severe cases, administer corticosteroid therapy.

4-3. SKIN DISEASES PERTAINING TO VIRAL INFECTIONS

a. **Herpes Simplex (Fever Blister).**

(1) Description/characteristics. Herpes simplex is a recurrent acute viral infection characterized by the appearance on the skin or mucous membranes of single or multiple clusters of small vesicles. These vesicles are filled with clear fluid, and the vesicle base is slightly raised. The infectious agent is a relatively large virus which frequently accompanies febrile (fever causing) illnesses: colds, cases of overexposure, exhaustion, nervous tension, and menstruation. Herpes simplex is a benign disease and occurs in almost everyone at one time or another. It may appear anywhere on the skin or mucous membranes, but it most commonly appears on the face (especially around the mouth), conjunctiva, cornea, or genitals. At times, there is an associated stomatitis (inflammation of the mucous membrane of the mouth). Vesicles usually appear after a period of tingling discomfort or itching. The principle symptoms are burning and stinging. Neuralgia may precede and accompany attacks. Single vesicles or small groups may come together to form large lesions. The vesicles usually persist for a few days. Then, they begin to dry and form a yellow crust. Vesicles on the nose, ears, or fingers may be painful. Self-limiting healing usually occurs within seven to ten days. Vesicles usually recur in the same areas. The time between episodes varies from weeks to months. Do not confuse herpes simplex with herpes zoster or impetigo. Examine lesions in the genital area carefully to be sure the lesion diagnosed as herpes simplex is not syphilis, lymphogranuloma venereum (LGV), or chancroid.

(2) Treatment. There is no specific medication for herpes simplex, but there is a course of treatment to follow. Apply topical lotions. Drying lotions and liquids help; however, moisture aggravates the condition and delays healing. Treat stomatitis, if it occurs, with mild saline mouthwashes. Medications which can be applied to the skin lesion include vioform three percent; tincture of benzoin, ten percent spirits of camphor, and the commercial product Campho-Phenique®. To abort lesions, apply a moistened styptic pencil several times daily. For herpes of the eye, DO NOT use corticosteroids, systemic or local. Costicosteroids may cause the problem to progress to dendritic ulcer of the cornea (cornea ulcer that spreads in all directions).

b. **Herpes Zoster (Shingles).**

(1) Description/characteristics. These skin lesions are an infection of the central nervous system primarily involving the dorsal root ganglia (a collection of nerve cell bodies on the dorsal root of each spinal nerve). The lesions are characterized by a blister and pain in the affected areas. Shingles is most common after the age of fifty. With rare exceptions, one attack of zoster gives a person lifelong immunity. Early symptoms include chills, fever, malaise, and gastrointestinal disturbances. These symptoms may be present from three to five days before the skin lesions appear. Pain usually precedes the appearance of skin lesions by about 48 hours or more. Severe pain and burning are common but may not be present.

(2) Treatment. No specific therapy is known: however, the following treatment may help the condition. Give barbiturates to help control tension and nervousness associated with neuralgia. Apply soothing powders or lotions to the skin lesions. Calamine lotion may be applied liberally and covered with a protective layer of cotton. An analgesic or codeine may be given for pain.

c. **Verrucae (Warts).**

(1) Description/characteristics. These are common contagious, benign epithelial tumors that are classified by either shape or location. No age group is immune to these tumors. They are most frequently seen in children and young adults. Usually, there are no signs or symptoms.

(2) Treatment. Warts can be easily removed, but they often recur at the same or a different site. It is often better to leave a single inconspicuous wart alone. These treatment techniques can be followed. Apply trichloroacetic acid to the wart every three to four days. When the wart whitens, apply phenol neutralized by alcohol. Nitric acid and silver nitrate may also be applied to the wart. In some moist anogenital warts, applying 25 percent podophyllum resin in benzoin tincture at weekly intervals is effective. Cryotherapy is used. Chemosurgery (destruction of tissue through the use of chemicals) is sometimes performed. The wart can be removed surgically. Electric desiccation (drying up) of the wart is sometimes performed.

4-4. BACTERIAL INFECTIONS OF THE SKIN

a. **Impetigo.**

(1) Description/characteristics. Impetigo is an inflammation of skin marked by isolated pustules. These skin lesions become crusted and ruptured. The causes of impetigo include minor skin injuries such as scratches, insect bites, mosquito bites, etc., which become infected with staphylococcal or streptococcal (group AB--hemolytic) infections. Initial lesions have vesicles, bullae, and pustules on the face and extremities. The lesions rupture, becoming red erosions. Ecthyma (ulcerated impetigo) is usually present. Impetigo is very contagious and often found in infants and young children. The organism staphylococcus is the most common cause of impetigo, but streptococcus occasionally causes the disease.

(2) Treatment. Begin by washing the affected area with soap and water three times a day. Scrub gently to remove crusts. Administer erythromycin 250 mg by mouth four times a day for 10 days.

b. **Furuncle (Boil)**

(1) Description/characteristics. A furuncle or boil is an inflammation of subcutaneous layers of skin gland or hair follicle. Causes include chronic diseases, staphylococcal organisms, or trauma to the skin such as shaving or squeezing. The

nodules are hot, tender, red, and hard. They may break down to form a necrotic core that has a pus-filled center and pus point. A boil starts with a hair follicle and occurs especially at the neck, axilla, and buttock. They are painful because of pressure being put on nerve endings, particularly in areas where there is little room for swelling of underlying structures.

(2) Treatment. DO NOT squeeze lesions near the nose. Treat these and other boils in this way. Administer penicillin VK by mouth four times daily for 10 days. Apply warm soaks to make the boil form a head. Make an incision and drain the boil.

c. **Carbuncle.**

(1) Description/characteristics. A carbuncle is an abscess of skin and deeper tissues--an extension of a furuncle invading multiple follicles. Carbuncles are caused by staphylococcal infections. Deeper than a furuncle and usually located on the lower neck and upper back, carbuncles heal slowly and leave a large scar. Signs and symptoms include the following:

(a) Possible fever.

(b) Two or more cores to one lesion.

(c) Multiple drainage points.

(d) Deep suppuration (production and discharge of pus).

(e) Extensive local sloughing.

(f) Multiple draining abscesses.

(2) Treatment. Apply hot compresses. Then perform an incision and allow the lesion to drain. Apply an antibiotic topically to the lesion or have the patient take an oral antibiotic. Consult a physician if the patient is resistant to conservative local antibiotic therapy.

d. **Cellulitis.**

(1) Description/characteristics. Cellulitis is an acute or chronic infection of the skin caused by complication of a wound, ulcer, or impetigo. Invasion of normal skin is possible, especially on the feet and lower legs. Cellulitis is usually caused by streptococcal bacteria, but rarely caused by staphylococcus bacteria. The affected area becomes warm, red, and tender. When pressure is applied to the skin, there is pitting edema in various places around the affected area. Later, blisters with pus form. If the affected area is large, the patient's entire body reacts. The lower extremities are often involved. Recurrent attacks of cellulitis may sometimes affect the lymphatic vessels and produce permanent swelling called "solid edema."

(2) Treatment. To treat cellulitis, give oral antibiotics; for example, penicillin VK. Elevate the affected area, if possible, and give warm soaks. If cellulitis is severe, recommend bedrest. Continue treatment until signs of the infection are absent for four to five days.

e. **Miliaria (Heat Rash)**.

(1) Description/characteristics. Heat rash is an acute inflammation of the sweat glands. The rash occurs when the free flow of sweat from the pores is obstructed. Heat rash is most common during hot weather or when an individual is working in areas where the environmental temperature is unusually high with humidity. The skin lesions are numerous and profuse, but they are usually confined to the covered areas of the body because these areas are where the temperature is the hottest. Three types of lesions are usually present; all are pinhead size. The vesicles are usually clear with red papules and very small pustules. Itching may be present.

(2) Treatment. Keep the patient cool and advise him to take cool, not hot, showers. The patient should wear light clothing and use talcum powder or cornstarch generously over the affected areas. DO NOT cover the area with ointments because they trap sweat causing the heat rash to become worse.

f. **Paronychia.**

(1) Description/characteristics. Paronychia is an inflammation of the skin around the nail. In acute cases, the causative organism is usually micrococi, Pseudomonas, or Proteus and sometimes Candida. The organism enters through a break in the skin; for example, hangnail or break caused by manicuring. Infections may follow the nail margin or may extend beneath the nail, and pus may form.

(2) Treatment. Do not apply hot compresses or soak acute cases that are infected. For bacterial infections, administer an appropriate systemic antibiotic. If the skin lesion has a pus-filled pocket, open the lesion carefully using the point of a scalpel.

g. **Folliculitis.**

(1) Description/characteristics. Folliculitis is an inflammation of the hair follicles caused by staphylococcal infection. Sycosis (barbare vulgaris) is a chronic, hard to manage type also known as pseudofolliculitis or barber's itch. This type of folliculitis is a deep-seated lesion. It is caused by trauma such as shaving and autoinoculation. The skin lesions will burn and itch slightly, and pain will occur on the manipulation of hair. In sycosis, the surrounding skin becomes involved also; therefore, the lesions look much like a form of impetigo or eczema with redness and crusting.

(2) Treatment. Treatment should include using good personal hygiene and keeping the affected area clean. Medications that can be applied to the affected area include iodochlorhydroxquin three percent in cream or ointment form, applied locally

twice a day, as well as an antibiotic such as polymyxin B in combination with bacitracin or oxytetracycline. The protocol of treatment facility for folliculitis or pseudofolliculitis should be followed.

4-5. FUNGAL INFECTIONS OF THE SKIN

a. Tinea Capitis (Scalp Ringworm).

(1) Description/characteristics. Tinea capitis is ringworm of the scalp. It is practically never seen in adults. There are usually no symptoms except itching. Lesions, undetectable to the naked eye, are small, grayish patches in which hairs are broken, scant, and lusterless.

(2) Treatment. Skin lesions can be treated effectively with microcrystalline griseofulvin until the skin is clear. It is no longer necessary to shave the patient's head. Advise the patient to use Kwell® shampoo and to take griseofulvin orally.

b. Tinea Corporis or Tinea Circinata (Ringworm of the Body).

(1) Description/characteristics. All species of dermatophytes (fungus capable of causing skin disease) may cause body ringworm, but some fungi are more common than others. Skin lesions can appear on the trunk, face, upper extremities, and in skin folds. Exposed skin areas are the most common place for lesions. The lesions are uncommon in temperate climates. The lesions have raised borders that spread from the outside and clear in the middle of the lesion. They must be distinguished from dermatoses such as pityriasis rosea, seborrheic dermatitis, annular psoriasis, and so forth. Intensive itching helps distinguish these lesions as tinea corporis/circinata.

(2) Treatment. These skin lesions can be effectively treated with griseofulvin if the lesions are severe, but you should check first with the medical officer. Vioform® three percent may be used, and tolnaftate is effective. Miconazole (Micatin®) 2 percent cream (Rx 38) is the most effective topical antitineal agent currently available in the United States.

c. Tinea Cruris (Jockstrap Itch).

(1) Description/characteristics. Tinea cruris may be caused by a variety of ringworm organisms and is very similar to tinea corporis. It is complicated by miliaria (skin eruption caused by sweat in the glands), secondary bacterial or candidal infection, and reaction to treatment. Both sides of the upper thighs may be affected, but eruption is usually asymmetrical (not identical on both sides of a central line). Typical lesions are usually confined to the groin and gluteal cleft (buttocks skin folds). Recurrence is common. Athletes (persons who perspire a lot), tight clothing, and obesity tend to favor growth of the organisms. Severe itching occurs in areas where skin rubs together; for example, between the scrotum and the thigh. Macules in such areas will be red with sharp margins, cleared centers, and the macules will be very active.

(2) Treatment. Give sitz baths (bath in which hips and buttocks of patient are the only parts under water) for infection in the genital area. If the area is acutely inflamed, use cool Burow's solution 1:10,000 for several days before applying any ointments. Any one of these medications can be used: Desenex® ointment applied twice daily; Tinactin®; or Halotex® 1 percent solution or cream. When bathing, rinse away all soap and dry the skin thoroughly. Use drying powder two or three times daily and be sure not to wear any rough clothing.

d. **Tinea Pedis (Athlete's Foot)(Epidermophytosis).**

(1) Description/characteristics. Tinea of the feet, an extremely common acute or chronic skin problem, occurs on the palms of the hands and soles of the feet. Two clinical forms of this skin problem are seen: filaments that are vegetative organs and spores that do not contain chlorophyll and are parasitic. Classic lesions are weeping vesiculations. There is also a noninflammatory type of lesion with small, nonweeping vesicles in the plantar surface of the foot and the sides of the toes, both very similar to dyshidrosis (deep eruption of blisters occurring primarily on the hands and feet accompanied by intense itching). Some people appear to be more susceptible than others to athlete's foot; however, the organisms that cause this disease are probably present on most people's feet all the time. The disease usually begins on the third and fourth interdigital spaces of the foot and then spreads to the planter surface of the arch. The lesions are softened areas with scaling borders. Maceration and moisture due to excessive sweating cause more skin lesions than fungi. Involved toenails become thickened and distorted. Acute flare-ups are common during warm weather. Tinea pedis may be confused with softening due to hyperhidrosis (excessive sweating) or occlusive (obstructive) footgear and other skin eruptions.

(2) Treatment. To treat tinea pedis, begin by maintaining good foot hygiene. Dry the skin between the toes thoroughly after bathing and rub away any macerated skin. Routinely, use a bland powder on the affected area. Place cotton between the toes at night. Aluminum chloride 30 percent concentration can be used to dry the area and for its antibacterial properties. Other medications that can be used include tolnaftate solution or cream (the best single topical agent), clotrimazole one percent cream or solution, haloprogin one percent solution or cream, miconazale two percent cream or one-half percent Whitfields ointment.

e. **Tinea Versicolor.**

(1) Description/characteristics. Tinea versicolor is a mild superficial infection of the skin usually found on the body trunk. This skin infection is caused by fungus. The affected area will not tan. This disease is not particularly contagious. It is apt to occur frequently in patients who wear heavy clothing and perspire a great deal. Epidemics may occur in athletes. Symptoms include mild itching, usually not uncomfortable enough to bother most people. The lesions are velvety, chamois-colored macules which may vary from 4 to 5 mm. The lesions are easily scraped off using a fingernail. The lesions appear on the trunk, upper arms, neck, and face. They may persist for years without notice. You should distinguish them from vitiligo and seborrheic dermatitis.

(2) Treatment. Lather in Selsun® daily. Wash affected areas in diluted vinegar or apply plain vinegar, which should be left on 24 hours a day for 7 days. Use medications that can be applied topically including tolnaftate (Tinactin®) solution (RX 21) and acrisorcin (Akrinol®) cream. Other medications that control this fungal disease include miconazole, clotrimazole, and haloprogin applied to the affected area. Encourage good skin hygiene. If the condition is not properly treated, it will usually recur.

f. **Moniliasis (Candidiasis).**

(1) Description/characteristics. Moniliasis is an infection of the skin or mucous membranes by a yeast-like fungus. Individuals usually affected include diabetics, obese persons who perspire freely, and pregnant women. Oral contraceptives, antibiotics, severe illness, and moist, hot skin also cause moniliasis. The lesions appear in moist skin fold areas and are bright red macules. Red moist lesions develop in the crotch without central clear zones. On the penis, the areas will be red and white. On the vagina or mouth (thrush), there will be a whitish thick coat (curds with flecks). Satellite or advance lesions will appear outward from the border of the main lesion.

(2) Treatment. Initial management of moniliasis includes washing the area frequently, keeping the area dry, and using nystatin cream or powder. Then, follow these procedures: Keep the area as dry as possible. Use nystatin cream or ointment every 4 hours topically; use nystatin oral suspension for thrush. The brand name for nystatin is Mycostatin®. Neomycin contains nystatin plus a steroid, neomycin sulfate, and gramicidin. Mycolog® cream or gentian violet can be applied. Check the patient's urine for glucose or fasting blood sugar to check for diabetes. If the patient does not respond to conservative therapy, refer him to a physician. Ask males if the wife is having a thick, white vaginal discharge. Nystatin vaginal suppositories can also be used.

4-6. CLOSING

The single most contributing factor producing skin diseases is poor personal hygiene. Educating the troops is the best preventive measure for skin diseases. In making a good evaluation, take into account all the factors covered in this lesson.

Continue with Exercises

EXERCISES, LESSON 4

INSTRUCTIONS. The following exercises are to be completed by writing the answer in the space provided. After you have completed all the exercises, turn to the "Solution to Exercises" at the end of the exercises and check your answers.

1. _____ is a common genetically determined skin disease consisting of discrete-pink or dull-red lesions from an unknown cause.

2. _____is an acute or chronic inflammation often sharply demarcated; produced by substances in contact with the skin.

3. _____is the general name for a group of noncontagious diseases that have a tendency toward erythema, swelling edema, oozing, and itching.

4. _____ is a chronic inflammatory disease of the sebaceous glands and hair follicles of the skin; the disease is caused by excessive oils.

5. A _____ may be described as a mass of fibrous tissue overgrowth at the site of a burn or skin wound that is more prevalent in Blacks and sometimes has crab-like projections.

6. _____ are round globular, cutaneous, or subcutaneous tumors arising from the sebaceous glands usually found on the face, neck, scalp, back, and genitalia.

7. Skin lesions which are an acute or chronic inflammatory skin reaction of an allergic origin with eruptions of evanescent (nourishing) wheals and caused by an ingestion of food or drugs are termed _____ or _____.

8. A _____is a congenital often hairy discolored spot elevated above the surface of the skin. This lesion may become a malignant melanoma.

9. _____ is an acute or chronic papulosquamous dermatitis with or without erythema that usually affects the scalp, face, the area of the sternum, interscapular (shoulder blade) area, umbilicus, and body folds.

10. The name of the acute infection of the central nervous system involving primarily the dorsal root ganglia and characterized by a blister and pain in the affected areas is _____.

11. Lesions that are single or multiple, elevated with waxy, pearly rooted borders with ulcerations that may occur in later stages are _____ skin lesions.

12. _____ is a recurrent viral infection characterized by the appearance on the skin or mucous membranes of single or multiple clusters of small vesicles. The disease is benign and occurs in almost everyone at one time or another.

13. _____ are highly malignant tumors of the skin or mucous membranes which may metastasize to any organ of the body.

14. A wart can be removed surgically, but if it is a single inconspicuous lesion, it is often better to _____.

15. Begin treating impetigo lesions by _____

_____

16. Treatment for furuncles (boils) includes applying warm soaks to make the boil form a head. Then, _____

17. In treating heat rash, do not cover the area with ointments because _____

_____

18. After bathing, a patient with tinea pedis should _____

_____

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 4

1. Psoriasis. (para 4-2c(1))
2. Contact dermatitis. (para 4-2b(1))
3. Eczema. (para 4-2a(1))
4. Acne. (para 4-2d(1))
5. Keloid. (para 4-2j(1))
6. Sebaceous cysts. (para 4-2f(1))
7. Urticaria.
   Hives (para 4-2h(1))
8. Nevi or mole. (para 4-2i(1))
9. Seborrheic dermatitis. (para 4-2g(1))
10. Herpes zoster or shingles. (para 4-3b(1))
11. Basal cell cancer. (para 4-2k(1))
12. Herpes simplex. (para 4-3a(1))
13. Malignant melanomas. (para 4-2l(1))
14. Leave the wart alone. (para 4-3c(2))
15. Washing the affected area with soap and water three times a day. (para 4-4a(2))
16. Make an incision and drain the boil. (para 4-4b(2))
17. Ointments trap sweating causing heat rash to become worse. (para 4-4e(2))
18. Dry the skin between the toes thoroughly and rub away any macerated skin. (para 4-5d(2))

End of Lesson 4

LESSON ASSIGNMENT

LESSON 5	Dermatological Drugs.
LESSON ASSIGNMENT	Paragraphs 5-1 through 5-14.
LESSON OBJECTIVES	After completing this lesson, you should be able to:

5-1. Identify the factors considered for skin absorption of a drug.

5-2. Identify the classification of lesions and the kind of topical application required for each type.

5-3. Identify common dermatological conditions and drugs used for their treatment.

SUGGESTION After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 5

DERMATOLOGICAL DRUGS

5-1. INTRODUCTION

a. **General.** Skin is a boundary between man and his environment-- physically and psychologically. The way a person's skin looks--healthy and glowing or full of ugly lesions--brings different responses from people he meets. A person with diseased skin or even a temporary rash may suddenly become self- conscious and shy. Skin problems of adolescents are painful in their development. Additionally, some skin diseases may be physically disabling. Thickened, dry skin with fissures on the hands of a skilled craftsman or surgeon can have an impact on whether or not the person can continue working. The physician who specializes in skin diseases, the dermatologist, can work to determine the cause of the skin problem, prescribe medication, and help the patient develop and function normally.

b. **Terms.** These terms will be used throughout this lesson. Become familiar with each term and its definition.

(1) Agent--anything capable of causing an effect on an organism.

(2) Bacteria--microscopic organisms concerned in producing disease.

(3) Disease--a malfunction of the body or of body parts.

(4) Drug--any substance or group of substances which affect living tissue. Specifically, the term may be defined as any substance used to prevent, diagnose, or treat disease.

(5) Fungus--rather large microorganisms which usually cause superficial, non life-threatening diseases.

(6) Infection--the invasion and multiplication of microorganisms in body tissues, resulting in local cellular injury.

(7) Inflammation--a reaction of tissues to irritation, infection, or injury.

(8) Parasite--a plant or organism that lives on or within another living organism.

(9) Pathogen--any disease producing organism.

(10) Side effects--an effect other than the one for which the drug was administered; for example, drowsiness.

(11) Topical--refers to the method of administering medicine. Topical application means that the medicine was applied directly on the skin.

5-2. DRUG USES

In today's society, there are legitimate and not so legitimate uses of drugs. Listed below are some of the legitimate uses:

a. **To Maintain Health.** Vitamins and minerals are used and abused in the pursuit of good health.

b. **To Reverse a Disease Process.** Antibiotics and chemotherapeutic agents are commonly used in medicine today to cure diseases.

c. **To Relieve Symptoms.** Drugs which act to relieve symptoms do not cure the patient. Instead, they help make the patient more comfortable in order for him to work or function. The assumption is that the body will cure itself.

d. **To Prevent Disease.** Vaccines and toxoids are widely used to prevent disease. In the 1940s and 1950s, many parents kept their children home to avoid polio. Today, most parents think of polio only when they take their children for the periodic (and necessary) vaccination for this still- present threat. Also, children today do not normally become ill with measles; instead, they are vaccinated for measles.

5-3. FACTORS AFFECTING SURFACE DRUG ABSORPTION

Many factors affect how the application of a particular drug will be absorbed by the skin surface.

a. **Skin Permeability.**

(1) Skin is durable because of the dermis, which is composed of connective tissue made up of fibers. Skin is selectively permeable; that is, skin allows only certain substances to enter the pores. The stratum corneum, the first layer of the epidermis, is a dense layer made up of dead, flattened cells that are filled with keratin (an insoluble protein). This layer of dead cells resists substances that are water-soluble or fat-soluble. In other words, the stratum corneum acts as the raincoat of the skin. If the epidermis is removed, the deeper layers of living cells, the dermis, act as a barrier to keep out fat-soluble substances.

(2) Because the skin has an oily secretion, medication applied to the skin surface is absorbed best if such medication is suspended or dissolved in oily media. Drugs combined with inorganic substances such as petroleum are not absorbed as well as drugs combined with synthetic ointment bases that are like sebaceous secretions.

b. **Drug Particle Size.** The size of the particles in the medication is an important factor in skin absorption. Very little absorption takes place if the particles in the skin medication are large and insoluble; for example, as in zinc oxide ointment. On the other hand, a great deal of absorption takes place when a solution such as oil of wintergreen in olive oil or in a lanolin base is rubbed on the skin.

c. **Degree of Skin Hydration.**

(1) Medication is absorbed by the skin better if the cornified layer (the top layer of the epidermis) is moist. Ointments soften the skin by wetting it, thus allowing the medication in the ointment to be absorbed into the skin easily.

(2) Another way to get moisture into the skin is to use an occlusive dressing over the skin lesion. An occlusive dressing is a dressing that prevents the loss of moisture from the skin's surface. This type of dressing can be made by placing an airtight plastic film (for example: Saran Wrap® or Handy Wrap®) over the medicated skin. Moisture is kept in the skin allowing the medicine to be absorbed into the skin. If a corticosteroid medication has been used, this medication will reduce skin inflammation faster. The occlusive dressing has kept moisture on the skin as well as prevented the medication from evaporating.

d. **Contact Time.** Absorption of medication on the skin is increased if the medication is in contact with the skin for longer periods of time. Since all disease organisms are not killed at the same time, there is a gradual decrease in the number of organisms. The longer the medication is on the skin lesions, the more organisms will be killed.

e. **Degree of Friction.** Skin medication can be absorbed better as the degree of friction is increased.

f. **Skin Temperature.** When the temperature of the skin increases, skin medication is absorbed faster. Also, in many cases heat alone is enough to kill disease organisms.

g. **Epidermal Damage.** The epidermal layer of the skin is the protective layer. Medication applied to an area in which this layer has been damaged means that there is nothing to keep the medication out; therefore, the medication will be absorbed quickly.

5-4. CLASSIFICATION OF SKIN LESIONS

Skin lesions can be divided into three types: acute lesions, subacute lesions, and chronic lesions. While reading about each type of lesion and its general treatment, remember this rule of thumb: If the lesion is dry, make it wet; if the lesion is wet, make it dry.

a. **Acute Lesions.** These lesions characteristically have appeared recently and are red, burning, swollen, itching, blistering, or oozing. Treatment usually consists of wet preparations such as soaks for lesions on the hands, arms, feet, or legs. Cool wet dressings are used for lesions of the head, neck, or trunk. If the lesions are over various parts of the body, baths can be used.

b. **Subacute Lesions.** Subacute lesions are not recent but do not go away and come back. The acute stages of these lesions have subsided, and the area is slightly swollen due to fluid retention. Treatment may be the wet preparations described in acute lesions or lotions that are shaken, or both.

c. **Chronic Lesions.** These lesions have been on the skin for a long while. They are inactive and are thickened, encrusted, cracked, and scaly. Such lesions can be treated with the wet preparations just described or shake lotions or both. Also effective are emulsions, hydrophilic ointments, pastes with a high powder content, and creams such as cold cream and vanishing cream.

5-5. TYPES OF TOPICAL FORMULATIONS

A topical formulation is medicine that is applied directly to the skin as opposed to a capsule that is swallowed or medication inserted directly into a vein. There are a number of topical medications: wet preparations, powders, shake lotions, creams, pastes, ointments, hydrocarbons, gels, and adherent dressings. The type selected depends on several factors: the characteristics of the skin problem; the general character of the patient's skin; previous medication; and drug allergies.

a. **Wet Preparations.**

(1) Baths, soaks, and wet dressings are referred to as wet preparations. The preparation selected depends on the location and size of the affected skin area. Each wet preparation can cleanse the skin and reduce itching.

(2) Wet dressings are wet compresses applied to skin areas. Wet dressings are used mainly when skin lesions are highly inflamed or are draining. When medicine is applied and then covered by a wet dressing, the lesion stays open and can drain freely. Wet dressings are used in treating oozing dermatitis (skin problems) or swollen, infected dermatitis (furunclitis, cellulitis). These dressings relieve the inflammation, burning, itching, and have a cooling effect on the skin. Wet dressings are suitable for even the most acute skin lesions.

(3) These solutions are commonly used in wet dressings to promote healing and produce a soothing effect:

(a) Normal saline solution--nonmedicated and hypoallergenic; used when treatment calls for drainage and heat.

(b) Burrow's solution--aluminum acetate solution; similar to boric acid but is less effective in preventing the growth of bacteria. It is more drying.

(c) Milk and lime water--used around the eyes or genitalia as a soothing, cold solution.

(d) Hypertonic magnesium sulfate solution--provides drainage and reduces swelling and inflammation.

(e) Boric acid solution--used for inflamed, superficial infections.

(f) Silver nitrate solution--an astringent (causes tissues to contract and reduces drainage) that kills bacteria and fungi.

(g) Vleminchx's solution--saturated lime solution which kills bacteria and fungi.

(4) Soothing baths are used when the skin problem is over a large area of the body and most frequently when the skin lesions itch; for example, chicken pox lesions. In addition to reducing itching, baths can be used for weeping, oozing erythematous (red) eruptions. Keep the water at a comfortable temperature, and avoid hot baths. A hot bath can burn the patient. Also, be sure to use a bath mat because medications used in the water may make the bathtub slippery. Substances used in baths include oatmeal, aveeno, and cornstarch. Such substances have a cooling and drying effect on the skin and reduce the itching.

b. **Powders.** Powders are used when there is a need to increase evaporation (dry the affected area), reduce friction, provide antipruritic (relieve itching) and cooling sensations, absorbent, drying effect, or for fungal infections. Zinc oxide, talc (magnesium silicate), and titanium dioxide are powders which reduce friction and absorb moisture. Powder should not be used if the patient is hypersensitive or has oozing skin surface. An oozing skin surface causes powder to cake and actually promotes bacterial growth. There are some side effects to powders. The starch in the powder can cause overgrowth albicans (a yeast-like fungi most commonly responsible for infections such as thrush and vaginitis). Talc, a useful protection for skin irritations such as prickly heat and diaper rash, should not be applied to healing wounds; the talc can cause severe granulomatous reactions (the formation of small, rounded, fleshy masses on the surface of a healing wound).

c. **Shake Lotions.** A solution or suspension of medication is the definition of a shake lotion. The name, shake lotion, comes from the fact that the solution is fine powders suspended in liquid and must be shaken thoroughly before use. The advantages of using medicated shake lotions are that they are easy to apply and stick well to the skin area. A disadvantage of shake lotions is that they may dry too much when applied to acute lesions. Also, shake lotions do not penetrate thickened chronic lesions as well as creams or ointments. A common shake lotion is calamine lotion. Once pink because of iron salts present as impurities, calamine lotion is now prepared from zinc oxide and prepared calamine.

d. **Creams.** Creams are an intermediate preparation between wet dressings that dry the skin lesion and ointments that keep lesions moist. Creams are semisolid, have a high percentage of water, are water-washable and don't leave the greasy residue after use that ointments leave. Additionally, creams absorb fluids from the skin. Cream spreads so easily on the skin that any medication dissolved in the cream comes in good contact with the skin.

e. **Paste.** Paste is a suspension of twenty percent to fifty percent powder in a greasy ointment base. Thicker and drier than ointments, paste does not penetrate as well as ointments but does not seal the wound as completely as ointments. Do not use paste on weeping lesions or hairy areas.

f. **Ointments.** An ointment is a preparation in which a drug is suspended or dissolved in a grease or oil base. Substances which may be used as a base include petrolatum, liquid petrolatum (mineral oil), olive oil, lanolin, and other animal fats. Ointments penetrate thickened lesions and act as an emollient (that is, soften skin and overlying crusts or scales). Ointments do not, however, permit drainage or evaporation and by trapping moisture may cause tissue to be softened from moisture. Do not apply ointment to hairy areas of the body because the ointment may penetrate to the base of a hair follicle causing folliculitis.

g. **Other Types of Medication.** Medication for skin problems also comes in the form of soaps, shampoos, and sprays. Each of these is used to treat particular skin problems.

(1) Soaps and soap substitutes. When regular soaps cause the skin to become excessively dry and irritated, a neutral soap called Oilatum can be used. People with oily skin can use Fostex® cake, Lava® soap, and Acne-Aid® detergent soap. Two other medicated soaps are Gamophen® and Mycoderm®. If soap proves too irritating to a person's skin, try soap substitutes such as Lowilacake®, Acidolate®, pHisoderm®, or pHisoHex®.

(2) Shampoos. These medicated shampoos are used to treat seborrheic dermatitis, a common skin disorder which can range from mild to severe. The skin lesions are reddish plaques with yellow, greasy scales and usually appear on the scalp, the middle of the face, the middle of the body, the eyebrows, and the ears. Shampoos used to treat this skin problem include Capsebon®, Sebulex®, Betadine®, Domerine®, Ar-Ex Tar®, Fostex Cream®, and Alvinine®. If the skin condition is caused by head lice and their eggs, use Kwell® shampoo. To use these shampoos most effectively, wet the hair with warm water and apply the shampoo as you would any shampoo. Allow the lather to remain on the scalp for at least five minutes. Wash the shampoo out of the hair; no special rinse or cleansing agent is necessary. Although medicated, these shampoos have a pleasant odor and leave the hair feeling soft. These shampoos are normally used several times a week as recommended by the doctor. Kwell® need only be used once for treatment of lice.

(3) Sprays (aerosols). Sprays are particularly good for moist skin lesions. Medication applied directly to the affected area could cause additional irritation from rubbing and more contamination and infection. Sprays are usually applied several times a day. Shake the container before using; then, with the can upright, spray the affected area from a distance of 3 to 6 inches. A spray of 2 to 3 seconds at a time is usually sufficient. To spray longer is a waste of medication. Sprays that contain corticosteroid and antibiotic-steroid medication include Diloderm®, Neo-Diloderm®, Meti-Derm® with neomycin, and Tarcortin®. A spray over which a bandage can be put is Betadine®, which is nonstinging and nonstaining. Anesthetic sprays include Americaine® and Tronothane®. A common antifungal spray is Desenex®. Two foams that come in aerosol containers are Aristoderm® (a steroid spray) and Neo-Aristoderm® (a steroid preparation). Apply foams by holding the can upside down next to the skin.

(4) Hydrocarbons. Medications containing hydrocarbons (a compound of hydrogen and carbon) are protective and greasy. Hydrocarbons are a stable medium for lipid soluble antibiotics. White petrolatum (Vaseline®) and mineral oil are examples of this type of medication. These skin medications have a soothing effect on chapped, irritated skin. The medication holds water in the skin and acts as a barrier for all outside irritants--air, wind, and dirt. Podophyllum is an example of a medication used in combination with hydrocarbons.

(5) Gels. Like hydrocarbon medications, gels act as a barrier against any outside irritant like dirt or wind. A gel can change from a solid to a liquid and from a liquid to a solid, having the advantages of both.

(6) Adherent dressings. These dressings are coated with a substance that helps the affected skin area dry. Adherent dressings also prevent irritation of the adjoining skin tissues. Substances that can be used on adherent dressings are tincture of benzoin and flexible collodion.

5-6. TYPES OF TREATMENT FOR DERMATOLOGICAL DISORDERS

Dermatological agents are drugs that exert either a chemical or physical action on the skin to aid in the correction of a skin disorder. In recent years, there have been a flood of new drugs so that now there are a large number of drugs. In an effort to reduce confusion and promote understanding, this classification of drugs dealing with skin problems has been made:

a. Antipruritic agents--medications that relieve symptoms but do not cure the disease.

b. Anti-inflammatory agents--steroids that reduce inflammation.

c. Anti-infective agents--medications that remove invasive or causative organisms.

d. Antiparasitic agents--drugs that destroy the itch mite.

5-7. ANTIPRURITIC AGENTS

a. **General.** Itching (pruritus) routinely accompanies many skin disorders. Itching may be a symptom of a disease which affects the person's entire system; in liver damage, for example, circulating bile salts cause itching all over the body. Persons suffering from allergic reactions, blood disorders, and various psychologic disturbances frequently experience itching. There are some simple antipruritics (agents which give relief to itching, burning, pain) to help the patient avoid scratching and possibly causing a secondary bacterial infection. Hot baths, heavy bed clothing, and rubbing of the skin should be avoided because heat will cause the capillaries to get bigger in turn increasing the itching feeling.

b. **Local Anesthetics.** Local anesthetics can be applied to a rather small area and act to block or interfere with itching, burning, or pain by interfering with those sensations. Here are three local anesthetics:

(1) Dibucaine. Dibucaine is a potent, toxic, long-acting local anesthetic used in ointments for relief of pain. About 15 times as potent and toxic as procaine (a mild medication), its anesthetic action lasts about three times as long as procaine.

(2) Benzocaine. This medication is also a local anesthetic, but benzocaine is available in sprays, powders, and creams. Because it does not mix well with water, benzocaine is absorbed into the skin slowly and is not toxic. The medication can be applied directly to an open wound or ulcerated surface and will stay in place doing its work of relieving pain for a long time.

(3) Lidocaine. Lidocaine is available in jelly form. This drug has a faster, more intense, and longer lasting effect (relief of pruritus) than an equal concentration of procaine.

c. **Phenol One Percent.** Phenol is a substance obtained from coal and used as an anesthetic and disinfectant. Phenol is often combined with other substances because its anesthetic property will stop itching and also act as a disinfectant. A one to five percent solution of cresol that contains phenol is sometimes used to disinfect skin. The compound Resorcinol (one percent phenol) is used to treat skin diseases such as eczema, seborrhea of the scalp, ringworm, and psoriasis.

d. **Menthol/Camphor.** Menthol provides a sensation of coolness by acting on the skin's receptors. The concentration used should be one-tenth percent to one-twenty-fifth percent. Camphor in a concentration of 0.5 percent to one percent provides a sensation of coolness on the skin by evaporation. Both menthol and camphor in medications are soothing to the skin.

e. **Boric Acid Solution.** Boric acid may be used in the form of solution, ointment, or dusting powder. A two percent boric acid solution used on a wet pack is very effective in relieving itching, burning, and pain of skin lesions. Additionally, boric acid solution acts as a disinfectant. Boric acid solution may be prescribed in water or in normal saline solution.

f. **Cool Starch Baths.** Two cups of starch to a bathtub of warm water can reduce pruritus. Caution the patient to be careful getting in or out of the bathtub because the starch can make the tub slippery.

g. **Diphenhydramine (Benadryl®).** Benadryl is an antihistamine used primarily in allergic reactions. This drug is a general preparation used for its antihistamine properties. It is useful in relieving bronchial spasms as well as serum reactions, urticaria, and drug reactions.

h. **Calamine Lotion, Phenolated and Mentholated.** This product is used as an astringent (an agent to dry mucous secretions, shrink skin, reduce inflammation of mucous membranes, promote healing, toughen skin) and as a protectant. Both these actions aid in reducing inflammation associated with insect bites, poison ivy, and sunburn. Phenol and menthol may be added to calamine lotion to produce an antipruritic (relieve itching) effect. Tell the patient using this product that the preparation is <u>for external use only</u>. The lotion must be shaken well before using it. Calamine lotion is soothing and drying. It may be applied locally three to four times daily or as needed for acute skin problems. Avoid using this medication for long periods of time; such use causes excessive drying.

i. **Oatmeal.** A commercial preparation of colloidal oatmeal or just oatmeal from the grocery store cereal section may be used in a bath as a soothing, cleansing, and anti-itching agent. An oatmeal bath is recommended for itching, hives, sunburn, poison ivy, prickly heat, diaper rash, and chapped skin. Add one cupful and soak in the tub for 30 minutes to one hour. Pat the skin dry with a towel; do not rub the skin. The oatmeal, whether in regular or colloidal form, makes the bath tub very slippery so caution patients to be careful when getting in or out of the bathtub.

5-8. ANTI-INFLAMMATORY AGENTS

a. **General.** As the name implies, these medications deal with skin lesions that are inflamed. Inflammation is a tissue reaction to irritation, infection, or injury characterized by localized heat, swelling, redness, and pain. Steroids applied to the inflamed area are the most effective treatment. Steroids affect the epidermis and the dermis in diseased skin and reduce swelling, redness, and pain. Even though an anti-inflammatory agent reduces inflammation, the agent does not cure the problem if the cause of inflammation persists.

b. **Hydrocortisone Cream and Ointment.**

(1) Hydrocortisone is one of approximately thirty steroid hormones extracted from the adrenal cortex (one of the two sections in each adrenal gland). Hydrocortisone and other steroids from the adrenal cortex change the normal inflammatory responses of the body by reducing inflammation. For application on the skin, this drug is available in creams, lotions, talc, and ointments. When applied on the skin, skin inflammation is reduced, but the cause of the inflammation is not cured. Medication containing hydrocortisone relieves the symptoms of all kinds of allergic reactions. Since allergic reactions are usually only temporary, hydrocortisone allows the patient to be largely symptom-free while the allergy runs its natural course. Fungus skin diseases are successfully treated with hydrocortisone.

(2) Some precautions should be taken when using steroids. Caution patients not to get the drug near their eyes. If a patient's skin becomes irritated, discontinue use of the steroid. Steroids such as hydrocortisone can be absorbed into a person's system through the skin; therefore, watch for sudden increase in fat in the patient's face or upper torso. Also watch for emotional or psychological changes in patients. Do not use steroids if the patient has impaired circulation; steroids could cause ulcers to form.

5-9. ANTI-INFECTIVE AGENTS

a. **General.** Anti-infective agents work to suppress local or superficial infections only. These agents do not cure the disease, but they do remove the organisms causing infection. Examples of such agents include antibacterial, antifungal, and antiparasitic medications.

b. **Anti-infective Agents.**

(1) Types of topical antibacterial agents include bacitracin ointment, bacitracin-Neomycin ointment, polysporin topical ointment, and Neosporin® ointment. Bacitracin is an antibiotic obtained from Bacillus subtillis. Bacitracin is effective against a broad spectrum of organisms including streptococci, staphylococci, and spirochetes. Bacitracin ointment can be applied directly on a skin lesion. DO NOT use bacitracin on a patient who is being treated with drugs for muscular problems or kidney problems.

(2) Mixtures of the antibiotics bacitracin, gramicidin, neomycin, and polymyxin B are commonly used to treat superficial infections. Mixtures of these antibiotics are very effective, and it is rare that organisms become resistant to treatment. Preparations include the following:

(a) Neosporin, Neo-Polycin (Polymyxin B, Neosporin and Bacitracin) in ointment, lotion, and powder form.

(b) Neosporin G cream (Polymyxin B, Neomycin, Gramicidin).

(c) Bacimycin ointment (Bacitracin, Neomycin).

(3) Single agents used to treat infections include:

(a) Erythromycin--one percent ointment (Ilotycin).

(b) Chloramphenicol--one percent cream (Chloromycetin®).

(c) Gentamicin—one-tenth percent cream/ointment (Garamycin®).

(d) Bacitracin ointment.

(e) Neomycin ointment.

c. **Antifungal Actions.**

(1) General. A fungus is a plant-like organism of the same class to which mushrooms and molds belong. They are everywhere in our environment, and those that cause systemic infection are often geographically limited. Although fungi are common plant pathogens, only about fifty of the thousands of known species are pathogenic to humans.

(2) Antifungal agents. An antifungal is an agent that destroys or prevents the growth of fungi. Some agents are used topically, while others are used systemically. The successful treatment of fungal infections depends on accurate identification of the offending fungus followed by proper selection and use of an antifungal drug. Most superficial infections can be adequately treated with topical therapy. Systemic fungal infections require the use of orally or intravenously administered drugs, some of which are toxic.

(3) Specific antifungal agents.

(a) Tolnaftate (Tinactin®). This is a topical antifungal agent used in the treatment of athlete's foot, jock itch, and ringworm. The dosage of the drug depends on the extent of the affected area. Tolnaftate is available as a solution, cream, powder, and as an aerosol powder. All containers should be labeled "FOR EXTERNAL USE ONLY." This drug is especially useful in treating superficial fungal infections that are resistant to other topical agents. Additionally, tolnaftate does not enter the patient's system when applied to the skin and does not produce skin sensitivity.

(b) Undecylenic Acid (Desenex®). This is an antifungal agent employed in the treatment of superficial fungus infections of the skin. Since it is fungistatic (an agent that inhibits growth of fungi) and not fungicidal (a substance that destroys fungus), attention must be given to other forms of hygiene. This agent may cause irritation on raw lesions; therefore, astringents are used to assist in reducing the rawness and irritation. An example of such an astringent is zinc, which may be incorporated into ointments, powders, and aerosols.

(c) Iodochlorhydroxyquin (Vioform®). This medication is chiefly used to treat amebic dysentery, but it may also be applied topically to treat various skin conditions. LIodochlorhydroxyquin exhibits antibacterial, antifungal, and antipruritic properties when it is applied to the skin. It can, therefore, be used to treat almost every kind of eczema. Both water-soluble creams and ointments of this medication can be purchased commercially.

(d) Nystatin (Mucostatin®). Nystatin is active against a number of yeasts and molds that cause "diaper rash" and thrush. Nystatin is relatively nontoxic, but nausea, vomiting, and diarrhea may occur if taken orally. This drug has staining properties, and patients using the drug should be cautioned. Nystatin is available as an ointment, in oral suspension, and in tablets.

(e) Selenium sulfide (Selsun®). This agent is a topical antifungal used in the treatment of dandruff and seborrheic dermatitis. The patient should be instructed not to use this medication if blistered, raw, or oozing areas are present on the scalp, and also to keep the medication away from the eyes. Selsun® is a prescription drug intended for external use only as is Selsun Blue®, an over-the-counter product. Both of these products may slightly discolor light colored hair.

(4) Candidiasis (Moniliasis®). Candidiasis, a superficial fungal infection, may involve almost any skin or mucous surface of the body. These fungal infections usually affect moist skin or mucous membranes. The mouth disease thrush is an example of this type of fungal infection. Medications that are used to treat this fungal infection include the following:

(a) Amphotericin B (Fungizone®). This agent is an antibiotic with antifungal activity and is used both topically and systemically. Amphotericin B may exert a "drying" effect on the skin, and in some cases may stain the skin. This drug is available as a cream, lotion, ointment, and parenteral injection (intravenous or intramuscular injection).

(b) Nystatin (Candex, Mycostatin®, Nilstat®). See paragraph 5-9c(3)(d).

(c) Clotrimazole (Lotrimin®). This is a broad-spectrum antifungal effective as a topical agent in the treatment of infections caused by disease-producing fungi and by Candida albicans (a yeast-like fungus responsible for thrush and vaginitis). Side effects associated with the use of this product include itching, burning, peeling, blisters, and erythema (redness).

(d) Miconazole (Monistat-Derm®). Miconazole is a synthetic antifungal effective against the common dermatophytes (any fungus which can cause a skin disease). The side effects for miconazole are the same as for clotrimazole in the previous paragraph. This product is available in cream form for either topical or vaginal applications, lotions for topical application, and in an injectable form.

(5) Dermatophytosis. Dermatophytosis is any superficial fungal infection of the skin; for example, athlete's foot. Superficial skin infections are caused by dermatophytes, fungi that invade only dead skin tissue or skin appendages such as the stratum corneum of the epidermis, nails, or hair. Dermatophytes cause a variety of skin lesions from mild and noninflammatory to acute causing a strong reaction by the body's immune system. The term tinea means superficial fungal infection and in combination with a second term indicates the location of the fungal disease (e.g., corporis, meaning body). Here are several superficial fungal infections with their respective treatments.

(a) Tinea corporis (body ringworm). This fungus involves the body with the exception of the scalp, hands, feet, groin, nails, and hair. This fungus can cause a variety of skin lesions: noninflammatory, scaly plaques; inflammatory pustules; or deep, tumorous lesions. Generally, there are only one to three lesions. Small lesions can be treated with a two percent miconazole cream or a 1 percent alotrimazole cream or lotion. Either medication should be rubbed on the affected area twice a day, continuing 7 to 10 days after the lesions disappear. Medication usually cures this fungus except in persons who suffer from a disease that affects their entire system.

(b) Tinea pedis (athlete's foot). Ringworm of the feet, more commonly known as athlete's foot, is a common fungal infection that usually begins between the toes and eventually may appear on the arch of the foot. The most effective treatment is griseofulvin. Medication should be started as soon as the disease is diagnosed. Improvement may not be seen immediately. Griseofulvin may not cure the condition, but it does prevent the disease from becoming more severe. Tinea pedis frequently recurs, causing some patients to require treatment for many months. Complete cure of athlete's foot is difficult, but this skin problem can be controlled with long-term therapy.

(c) Tinea capitis (scalp ringworm). This fungus mainly attacks children, is highly contagious, and may become epidemic. There are three forms of tinea capitis: inflammatory, noninflammatory, and favus (a chronic fungus infection of the scalp). Oval patches of hair loss occur in noninflammatory tinea capitis. A boggy, pustular nodule is present in inflammatory tinea capitis, and a crusty, scaly area around the hair near its exit from the scalp is characteristic of favus. In most cases, this fungal infection can be cured by giving microcrystalline griseofulvin, one twenty-fifth to one tenth mg by mouth daily or twice daily for two weeks. This medication must be given with meals or milk. A lotion or cream of two percent miconazole or one percent clotrimazole may be rubbed in twice daily. This fungus is very persistent but usually clears up spontaneously at puberty. Even if not treated, most scalp ringworm infections will clear up spontaneously in one or two years.

(d) Tinea cruris (groin ringworm). This fungus, commonly called jock itch, may be caused by several organisms. The fungus is more common in men than in women, and itching may be severe. Lesions usually appear on the thighs. Tight clothing, moisture, and heat cause the fungal organisms to grow. Athletes and other individuals who perspire a lot are particularly susceptible to groin ringworm. Treatment is two percent miconazole cream or one percent clotrimazole cream applied to the lesions. The disease usually clears up promptly with treatment.

(e) Tinea unguium (ringworm of the nails). This fungus is caused by an organism similar to the one which causes athlete's foot. Nails become thickened, lusterless, and debris accumulates under the free edge of the nail. Eventually, the nail may separate and come off. Treatment may be successful if griseofulvin is applied until the nail has regrown completely and all infected material is gone. This process may require six to twelve months.

(6) Systemic anti-infective agents. An anti-infective agent is a drug which is used in the treatment or prevention of infections. These agents are also called chemotherapeutic agents. Antibiotics and sulfonamides are two examples of these agents. Broad spectrum antibiotics are effective against specific microorganisms in both gram-positive and gram-negative classes. Narrow spectrum antibiotics affect only a few microorganisms. The majority of these antibiotics are penicillin derivatives with a specific spectrum for gram-positive organisms only. Included in anti-infective agents are potassium penicillin G (injection and tablet form) and tetracycline tablets.

(a) Potassium penicillin G. Natural penicillins are derived from certain species of molds and other fungi. They produce their effects by inhibiting biosynthesis of cell wall mucopeptides. Therefore, all classes of penicillin are bacterial. Natural penicillins are narrow spectrum antibiotics which are primarily effective against gram-positive and a few gram-negative bacteria. The natural penicillins such as potassium penicillin G are the first drug of choice in the treatment of infection caused by gram-positive and a few gram-negative bacteria. Intramuscular injection of potassium penicillin G provides maximal blood concentration within thirty to sixty minutes. The action of the injection lasts a relatively short period of time which means that injections are required every three to four hours to maintain sufficient medication in the blood. The injection must be given deep into the muscle because of the frequency of injections and the pain produced by the medication.

(b) Tetracycline tablets. Tetracycline is a broad spectrum antibiotic effective against gram-positive and gram-negative bacteria. Tetracycline drugs originate from strains of streptomycin containing broth that is fermented in deep tanks. If this drug is administered orally, absorption takes place in the stomach and upper portion of the small intestine. Tetracycline clears up the skin condition of acne pustules by reducing the concentration of irritant fatty acids in the sebum. When used in the treatment of acne, the dose is 250 mg every day or twice a day. DO NOT give tetracyclines to children during tooth development. Caution anyone taking this drug to avoid antacids, milk, dairy products, iron, or foods containing aluminum, calcium, or magnesium.

d. **Topical Antiparasitic Agents.** These agents are destructive to itch mites (scabicide). Both lice and mites of Sarcoptes scabiei are parasites that attack humans and cause skin lesions. Lice bite the skin to obtain blood which they feed on. Leaving their eggs and excrement on the skin, lice are passed on from person to person. The Sarcoptes scabiei mite, barely visible with the naked eye, causes severe itching at night. The disease scabies caused by this mite is usually acquired by sleeping with an

infested individual or by other close contact. Gamma Benzene Hexachloride ointment (lindane, Kwell^{R}) is the drug of choice for the treatment of lice and scabies infestations. Usually, one application is sufficient to eliminate the problem.

5-10. SKIN CLEANSING

a. **Wet Dressings.**

(1) Magnesium sulfate (Epsom salts). This drug, although normally used to flush poisons out of the human body, can also be used in a bath or a soak to cleanse the skin and to relieve pain.

(2) Aluminum acetate or Burrow's solution (Domeboro®). This medication is similar to boric acid but more drying. Bur-Veen®, Domeboro®, and Soy-Boro® are commercial products of this medication. This medication is good to apply to a skin lesion when the eruption needs to drain.

(3) Potassium permanganate. This medication may be prescribed in water or in normal saline solution. It is used in inflammatory, superficial infections and is applied to the skin lesion then covered by a wet dressing. Although soothing to the affected area, the medication leaves a brown stain on the skin. Dalidome may be used instead of potassium permanganate. Dalidome is a nonstaining preparation.

b. **Soaps and Shampoos.**

(1) Superfatted soaps. Use these soaps when the skin is extra dry. Elderly people often need such soap.

(2) Neutral soaps or soap substitutes, medicated soaps. Oilatum soap, a neutral soap containing peanut oil, is used when regular soaps produce excessive dryness and irritation. For oily skins, use Fostex® cake, Lava® soap, or Acne-Aid® detergent soap. Gamophen® and Mycoderm® are examples of medicated soaps. Soap substitutes are used for cleansing the skin when soap is too irritating. Soap substitutes include Lowilacake®, Acidolate®, pHisoderm®, and pHisoHex®.

(3) Medicated shampoos. A variety of medicated shampoos fight skin problems on the scalp: Capsebon®, Sebulex®, Betadine®, Domerine®, Fostex®, and Alvinine®. Kwell® is a shampoo used to treat pediculosis capitis, Phthirus, and their nits. Wet the hair with warm water, apply the shampoo as you would any shampoo, and allow the lather to stay on the scalp for at least 5 minutes. These shampoos leave the hair soft and have a pleasant odor. Only one application of Kwell^{R} is necessary when it is used to treat pediculosis and Phthirus.

5-11. RESTORATION OF CORRECT HYDRATION

a. **Powders.** Powders are used to dry the affected area of skin.

b. **Emollient Baths.** These baths are used frequently for their antipruritic effect. Substances such as starch, Aveeno, and Soyaloid mixed in a bathtub of water can promote healing or drying of lesions and reduce the itching.

c. **Tar Baths.** In cases of psoriasis, seborrheic dermatitis, and chronic eczema, tar baths have proven most effective. Use one-half to one ounce of solution of coal tar, added to the bath water.

5-12. REDUCTION OF CALLUS AND SCALES

a. The appearance of scales and calluses on the skin are usually the result of epidermal cells undergoing rapid multiplication. Calluses are most common on the soles of the feet over the metatarsal bones. Both scales and calluses can be treated by keratolytics (a substance which causes the epidermis to scale).

b. A keratolytic is an agent that causes sloughing off of the cornified epithelium (the horny or hard layer of the skin). A keratoplastic (mild keratolytic) effect is seen when the drug simply softens the keratin and loosens the cornified epithelium. Keratolytic agents are used to remove warts and corns and to treat severe acne. These agents are also used in the treatment of eczema, psoriasis, and seborrheic dermatitis.

c. Specific keratolytics include the following agents:

(1) Coal tar. This agent is used as a keratoplastic in the treatment of eczema, psoriasis, and seborrheic dermatitis.

(2) Resorcinol. Resorcinol is used as a keratoplastic in the treatment of acne and seborrheic dermatitis.

(3) Salicylic acid. This agent is used as a keratolytic when present in concentrations of five percent to twenty percent and as a keratoplastic when present in concentrations of one percent to two percent.

(4) Sulfur. Sulfur is used as a keratoplastic in the treatment of acne and seborrheic dermatitis.

(5) Tretinoin (Retin-A^{R}). This agent is used in the treatment of severe acne. The application of the medication to the affected area will produce a horny layer of skin which is easily removed. It is important that the patient use this preparation as directed by the physician and package directions. Do not apply this medicine to windburned or sunburned skin, open wounds, inside the nose, around the eyes, or around the mouth. The patient should avoid exposing the area being treated to too much wind or sun (or

sun lamp). When the patient begins using this product, he may find that he is more sensitive to cold temperatures and to wind; therefore, protection should be worn until he knows how he reacts. This product is available as a cream, liquid, or gel.

5-13. COMMON DERMATOLOGICAL DRUGS

a. **Drying Agents.**

(1) Calamine lotion. Calamine lotion is a drying agent. This medication is a shake lotion, termed that because it is essential to shake the medication well before using it. The lotion contains prepared calamine, zinc oxide, glycerin, magma of bentonite, and lime water. The lotion should be applied locally 3 to 4 times daily or as needed. Calamine lotion can be used for acute dermatitis. Do not use it for long periods of time because the lotion will cause excessive drying. Add one percent phenol to reduce itching. The advantage of lotion such as calamine is that it is easy to apply and sticks to the surface well. The disadvantages include excessive drying and the fact that calamine does not penetrate chronic skin lesions as well as creams or ointments. People who have had poison oak or poison ivy are probably very familiar with calamine lotion.

(2) Zinc oxide. Zinc oxide, another drying agent, can be applied topically as a mild antiseptic and astringent for a wide variety of skin disorders. Zinc oxide can be put into ointments, pastes, lotions, or powders to be applied to the skin. Paste composed of zinc oxide, gelatin, glycerin, and water can be used successfully as a supportive and protective plaster for eczema.

(3) Salicylic acid and sulfur (Fostex®). This preparation is available in cream or soap form to treat acne. The medication contains two percent salicylic acid and two percent sulphur. Salicylic acid has a slight antiseptic action with a marked keratolytic effect when applied to the skin. Under ordinary circumstances, it is painless. It should be applied for a period of time for its full effect on thickened keratin. Apply petrolatum to the normal skin around the affected area. This will prevent normal skin from becoming irritated by the medication. Be careful to keep salicylic acid away from your eyes because this medicine can damage the cornea. Salicylic acid, a keratolytic or peeling agent, can be applied to the skin in collodion, lotion, or ointment form.

(4) Hexachlorophene. This medication is very useful as treatment in the management of acne, furuncles, diaper rash, eczema, and similar conditions. Usage reduces the residual bacterial count on the skin. No tissue reaction is seen on wounds and burned surfaces from the action of the medication even when it is used daily over a long period of time. The medication should be applied to skin that has just been moistened and also thoroughly cleansed of blood and other organic matter. Hexachlorophene is used as an active germicidal ingredient in Dial® and pHisoHex® as well as many other products.

b. **Lubricating Agents.** Both surgical lubricant (K-Y Jelly) and petrolatum (Vaseline Petroleum Jelly) are used as lubricating agents.

c. **Topically Applied Drugs.** These medications may seem somewhat basic and unimportant. They do, however, often provide beneficial relief from local skin irritations and discomfort. They also prevent the development of more serious skin problems.

5-14. CLOSING

Dermatologic drugs are targeted directly to the problems of the skin in contrast to other drugs that sometimes act at sites remote from the actual problem. Since skin function is vital to an individual's survival and appearance, proper uses of these drugs are important to the patient's health and emotional well-being.

Continue with Exercises

EXERCISES, LESSON 5

INSTRUCTIONS. The following exercises are to be completed by writing the answer in the space provided. After you have completed all the exercises, turn to the "Solution to Exercises" at the end of the exercises and check your answers.

1. List three uses, legitimate or illegitimate, of drugs in today's society.

   a. _____.

   b. _____.

   c. _____.

2. List four factors affecting how medication is absorbed on the skin surface.

   a. _____.

   b. _____.

   c. _____.

   d. _____.

3. Skin lesions which have appeared recently are red, burning, swollen, itching, blistering, or oozing can be classified as _____ lesions.

4. Skin lesions which have existed for a long time and are thickened, encrusted, cracked, and scaly are classified as _____ lesions.

5. Wet preparations on skin lesions relieve itching, are cleansing, and are suitable for even the most _____ skin lesions.

6. List three reasons to use a powder as a dermatological medication.

   a. _____.

   b. _____

   c. _____.

7. Shake lotions are convenient to apply but may be excessively _____.

8. Two advantages of using medication in ointment form is that ointments provide mechanical protection and _____ skin lesions.

9. Antipruritic agents are medications that relieve skin lesions with these symptoms: _____, _____, and _____.

10. An anti-inflammatory agent can suppress inflammation but the _____ of the disease remains.

11. _____ agents remove invasive or causative organisms.

12. Antibacterial agents suppress local or superficial _____ only.

13. An antifungal agent is a drug that _____

    _____

14. Scalp ringworm, ringworm of the nails, and athlete's foot are examples of a superficial fungus infection called _____.

15. List three ways in which wet preparations can be beneficial to the skin.

    a. _____.

    b. _____.

    c. _____.

16. Fostex[R], Lava[R], Gamophen, and Mycoderm are all examples of _____. (form of medication)

17. The purpose of an emollient (soothing) bath is to _____

    _____

18. A(n) _____ agent is an agent which induces sloughing of the horny or hard layer of skin.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 5

1. You are correct if you listed any 3 of the following:

   Maintain good health.
   Reverse a disease process.
   Relieve symptoms.
   Prevent disease. (paras 5-2a through d)

2. You are correct if you listed any 4 of the following:

   Skin permeability.
   Drug particle size.
   Contact time.
   Skin temperature.
   Epidermal damage. (paras 5-3a through g)

3. Acute (para 5-4a)

4. Chronic. (para 5-4c)

5. Acute. (para 5-5a(2))

6. You are correct if you listed any 3 of the following:

   Increase evaporation.
   Reduce friction.
   Provide antipruritic (anti-itching relief) and cooling sensation.
   Absorbent. (para 5-5b)

7. Drying (para 5-5c)

8. Penetrate. (para 5-5f)

9. Itching.
   Burning.
   Pain. (para 5-7a)

10. Cause. (para 5-8a)

11. Anti-infective. (para 5-9a)

12. Infection (para 5-9a)

13. Destroys or prevents the growth of fungi. (para 5-9c(2))

14. Dermatophytosis. (paras 5-9c(5)(a) through (e))

15. You are correct if you listed any 3 of the following:

    Relieve inflammation.
    Have cooling effect on the skin.
    Relieve itching.
    Relieve burning. (para 5-5a(2))

16. Medicated soaps. (para 5-5g(1))

17. Reduce itching and soothe weeping red eruptions. (para 5-5a(3))

18. Keratolytic. (para 5-12b)

End of Lesson 5